COLLINS

overhaul manual

Collins Radio Company

1051B-1 VHF NAV Receiver Planar Assembly (Part of 51RV-2B)

COLLINS

Cedar Rapids, Iowa 52406 Area Code 319 395-1000 Cable: COLINRAD

August 1, 1969

TO: HOLDERS OF 1051B-1 VHF NAV RECEIVER PLANAR ASSEMBLY OVERHAUL MANUAL (523-0760759)

REVISION NO 2 HIGHLIGHTS

Pages which have been revised are listed below with descriptions and reasons for the changes. Determine the revised pages which are applicable to your equipment. Replace the corresponding pages of your manual. Retain this letter of transmittal for future reference.

PAGE NO	REVISION DESCRIPTION AND REASON FOR THE CHANGE	SERVICE	EFFECTIVITY
801 through 816	Added the following information for troubleshooting the 1051B-1: Troubleshooting aids, figure 803A. Test procedures for audio test generator and timer Z2 using the 977C-1, figure 803B. Voltages and waveforms on the overall schematic, figure 804.		
1006	Added information on an extender cable assembly and connectors, and deleted illustration.		
1101 through 1156	Includes all production changes to the equipment.		

523-0760759-201113
1 June 1968
2nd Revision, 1 August 1969

COLLINS

overhaul manual

1051B-1 VHF NAV Receiver Planar Assembly (Part of 51RV-2B)

©Collins Radio Company 1968
©Third Edition 1969
Printed in the United States of America

Collins Radio Company | Cedar Rapids, Iowa

1051B-1 VHF NAV Receiver Planar Assembly

List of Effective Pages

*The asterisk indicates pages changed, added, or deleted by the current change.

Page No	Issue
*Cover	Aug 1/69
*Title	Aug 1/69
*A thru C	Aug 1/69
i thru ii	June 1/68
*iii thru iv	Aug 1/69
v thru vi	June 1/68
*1	Aug 1/69
2 thru 13	June 1/68
14 Blank	June 1/68
15	June 1/68
16 Blank	June 1/68
17 thru 21	June 1/68
22 Blank	June 1/68
23 thru 33	June 1/68
34 Blank	June 1/68
35 thru 50	June 1/68
101	June 1/68
102 Blank	June 1/68
201 thru 203	June 1/68
204 Blank	June 1/68
301 thru 303	June 1/68
304 Blank	June 1/68
401 thru 422	June 1/68
501	June 1/68
502 Blank	June 1/68
601	June 1/68
602 Blank	June 1/68
701 thru 713	June 1/68
714 Blank	June 1/68
715	June 1/68
716 Blank	June 1/68
717	June 1/68
718 Blank	June 1/68
719	June 1/68
720 Blank	June 1/68
721	June 1/68
722 Blank	June 1/68
723	June 1/68
724 Blank	June 1/68
725	June 1/68
726 Blank	June 1/68
727	June 1/68
728 Blank	June 1/68
729	June 1/68
730 Blank	June 1/68
731	June 1/68
732 Blank	June 1/68
733	June 1/68
734 Blank	June 1/68
735	June 1/68
736 Blank	June 1/68
737	June 1/68
738 Blank	June 1/68
739	June 1/68
740 Blank	June 1/68
741	June 1/68
742 Blank	June 1/68
*801	Aug 1/69
802 thru 803	June 1/68
804 Blank	June 1/68
805	June 1/68
806 Blank	June 1/68
*807 thru 808	Aug 1/69
*808A thru 808G Added	Aug 1/69
*808H Blank Added	Aug 1/69
*809	Aug 1/69
810 Blank	June 1/68
*811	Aug 1/69
812 Blank	June 1/68
*813	Aug 1/69
814 Blank	June 1/68
*815	Aug 1/69
816 Blank	June 1/68
901	June 1/68
902 Blank	June 1/68
1001 thru 1006	June 1/68
*1007	Aug 1/69
1008 Blank	June 1/68
1009 thru 1012	June 1/68
*1101 thru 1154	Aug 1/69
*1155 Added	Aug 1/69
*1156 Blank Added	Aug 1/69

Collins Radio Company welcomes your comments concerning this instruction book. Although every effort has been made to keep it free of errors, some do occur. When reporting a specific problem, please describe it briefly and include the instruction book part number, the paragraph or figure number, and the page number.

Send your comments to: Collins Radio Company
Publications Engineering Department
Mail Station 172-002
Cedar Rapids, Iowa 52406

1051B-1 VHF NAV Receiver Planar Assembly

Record of Revisions

RETAIN THIS RECORD IN THE FRONT OF MANUAL.
ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL,
AND ENTER DATE INSERTED AND INITIALS.

ASSIGNED TO (JOB TITLE)	LOCATION

REV. NO.	REVISION DATE	INSERTION DATE	BY	REV. NO.	REVISION DATE	INSERTION DATE	BY
1	June 15/68						
2	Aug 1/69						

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
51RV-2B SB 1 thru 8	These service bulletins do not apply to the 1051B-1 receiver planar assembly	Na	Na
51RV-2B SB 9	Reduce power dissipation of Z6Q1 and Z6Q2 in 5-volt power supply	2	8-1-69

1051B-1 VHF NAV Receiver Planar Assembly - Table of Contents

	Page
DESCRIPTION AND OPERATION	1
1. General	1
2. Purpose of Equipment	1
3. Equipment Specifications	1
4. Equipment Description	4
A. Mechanical Description	4
B. Electrical Description	5
5. Theory of Operation	8
A. General	8
B. Block Diagram Theory of Operation	8
C. Detailed Theory of Operation	17
DISASSEMBLY	101
1. General	101
2. Precautions and General Techniques	101
3. Removal of Cards and Covers From Sideboard	101
A. Audio Test Generator and Timer Z2	101
B. Cover Removal	101
CLEANING	201
1. General	201
2. Cleaning Materials	201
3. Procedures	202
A. Cables, Covered	202
B. Chassis, Wired	202
C. Connectors	202
D. Insulators, Ceramic or Plastic	203
E. Jacks	203
INSPECTION/CHECK	301
1. General	301
2. Procedures	301
A. Capacitors	301
B. Chassis	301
C. Connectors	301
D. Covers and Shields	302
E. Jacks	302
F. Laminated Circuit Boards	302
G. RF Coils	302

Page

H. Resistors 302
I. Semiconductors 302
J. Soldered Terminal Connections 302
K. Transformers and Reactors 303
L. Wiring 303

REPAIR 401

1. General 401
2. Repair Tools and Supplies 401
3. Repair and Replacement Procedures 407
A. Replacement of Resistors, Capacitors, and Diodes on Printed Circuit Boards 407
B. Replacement of Transistors, Transformers, and Encapsulated Circuits (Blue Modules) on Printed Circuit Boards 409
C. Replacement of Integrated Circuits (Flatpacks) on Printed Circuit Boards 410
D. Protective Coating After Repairing 412
E. Replacement of Contacts (Pins) in Main Sideboard Rear Connector Z1P1. 413
F. Replacement of Contacts (Pins) in Main Sideboard Connectors Z1J2 and Z1J3 417
G. Replacement of Contacts (Receptacles) in Audio Test Generator and Timer Connectors Z2P2 and Z2P3. 420

ASSEMBLY 501

1. General 501
2. Precautions and General Techniques 501
3. Replacement of Cards and Covers on Sideboard 501
A. Cover Replacement 501
B. Audio Test Generator and Timer Z2 501

FITS AND CLEARANCES (Not Applicable) 601

TESTING 701

1. General 701
2. Test Equipment and Power Requirements 701
A. Test Equipment 701
B. Power Sources 701
3. Definition of Standard Test Signals 701
A. General 701
B. Input Levels 701
C. Standard VOR Test Signals 702
D. Standard Localizer Test Signal 702
4. Test Equipment Calibration 703
A. General 703

Page

B. Boonton 211-A Signal Generator Percent Modulation Calibration . . 703
C. Collins 479S-3 Audio Signal Generator Calibration 704
5. Test Procedures 705
A. Use of Test Procedures 705
B. Test Procedures 706
6. Audio Test Generator and Timer Wiring Options 708
A. General 708
B. Modification Procedures 709

TROUBLESHOOTING 801

1. General 801
2. Test Equipment and Power Requirements 801
A. Test Equipment 801
B. Power Requirements. 801
3. Procedures 801

STORAGE INSTRUCTIONS 901

1. General 901

SPECIAL TOOLS, FIXTURES, AND EQUIPMENT. 1001

1. General 1001
2. Test Equipment Required. 1001

ILLUSTRATED PARTS LIST 1101

Introduction 1101
Manufacturer's Code and Name Index 1101
How to Use This Illustrated Parts List 1105
Numerical Index 1106
Symbol Index 1113
Group Assembly Parts List 1118

List of Illustrations

Figure Page

1 1051B-1 VHF NAV Receiver Planar Assembly vi
2 Equipment Covered 1
3 Equipment Specifications 2
4 1051B-1 VHF NAV Receiver Planar Assembly, Subassembly Identification . 4
5 Adjustment Controls 7
6 1051B-1 VHF NAV Receiver Planar Assembly, Block Diagram 13
7 Tune Voltage Switch, Simplified Schematic Diagram 17
8 First Mixer, Simplified Schematic Diagram 18

Figure		Page
9	First IF. Amplifier, Simplified Schematic Diagram	19
10	Detector/AGC Circuits, Simplified Schematic Diagram	21
11	Timer Circuit, Simplified Schematic Diagram	33
12	Sync Trigger Input Circuit and Associated Waveforms	37
13	30-Hz Sinusoid Output of RC Combiner	39
14	9960-Hz Multivibrator Equivalent and Waveforms	40
15	Glideslope/Localizer Combiner, Simplified Schematic Diagram	42
16	Glideslope/Localizer Combiner Test Equivalents	44
17	RMI Servo Amplifier, Simplified Schematic Diagram	46
18	VOR/LOC Mode Relay, Simplified Schematic Diagram	50
201	Cleaning Materials	201
301	Fixed-Capacitor Inspection	301
401	Repair Supplies	401
402	Flatpack Mounting Diagram	411
403	Z1J2 and Z1J3 Contact Extraction/Insertion Diagram	420
701	1051B-1 VHF NAV Receiver Planar Assembly, Test Setup Using Standard Test Equipment	710
702	1051B-1 VHF NAV Receiver Planar Assembly, Test Setup Using 977A-1 Test Panel	711
703	Test Equipment Initial Control/Switch Settings	712
704	1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures	715
705	1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures	727
706	Audio Test Generator and Timer Z2 Test Procedures Using 977A-1 Test Panel and 977C-1 Test Unit (To Be Supplied)	741
801	1051B-1 VHF NAV Receiver Planar Assembly, Subassembly Location	802
802	1051B-1 VHF NAV Receiver Planar Assembly, Adjustment Location	803
803	Audio Test Generator and Timer Z2, Test Points and Adjustments	807
803A	1051B-1 Troubleshooting Aids	808
803B	Audio Test Generator and Timer Z2, Test Procedures Using 977C-1.	808B
804	1051B-1 VHF NAV Receiver Planar Assembly, Schematic Diagram	808G
1001	Test Equipment Required	1001
1002	Repair Tools	1002
1003	51RV-2B Test Jig, Schematic Diagram.	1004
1004	Extender Cables and Connectors	1007
1005	Test Connector Adapter Unit, Schematic Diagram	1009
1006	Modified Needle-Nosed Pliers	1011
1007	Special Soldering Tip	1011
1008	Impact, Backup, and Insertion Tools for Z1J2 and Z1J3 Contacts	1012
1101	1051B-1 VHF NAV Receiver Planar Assembly	1118
1102	8 MHz IF	1121
1103	Tuner.	1125
1104	Test Oscillator	1129
1105	Test Generator	1132
1106	Power Supply Chassis	1139
1107	Receiver Board	1141
1108	500 kHz IF	1144
1109	Card Servo	1147
1110	Audio Section of Receiver Board	1149
1111	Power Supply	1152

FOREWORD

This manual has been prepared in accordance with Air Transport Association Specification No. 100 for Manufacturer's Technical Data. This manual will facilitate the effective, continued operation of the 1051B-1 VHF NAV Receiver Planar Assembly.

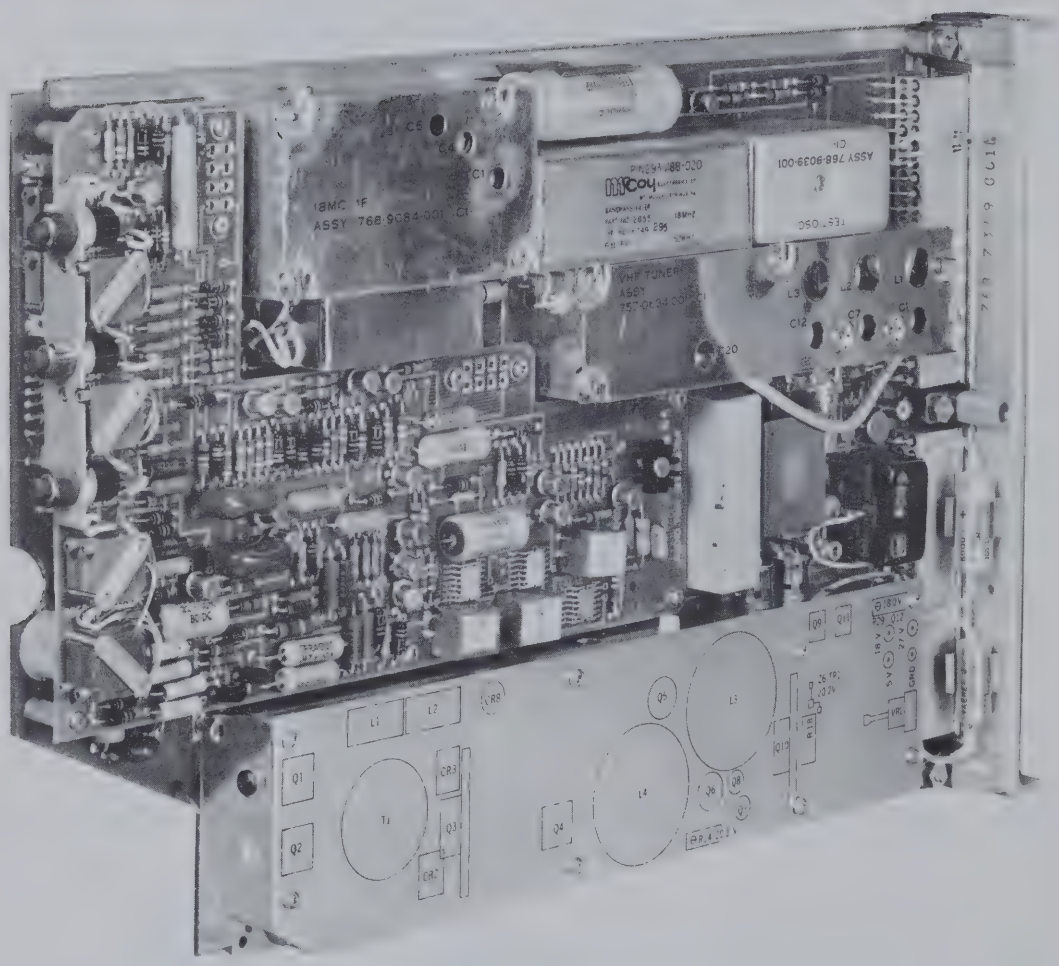
This manual contains all information required for shop testing and repair. It presents detailed circuit theory with emphasis on that which will be especially helpful for effective troubleshooting. It contains complete performance tests and alignment procedures. Information included in the illustrated parts list makes it possible to determine the Collins part number and physical location of a part if its reference designation is known or the Collins part number when only the physical location is known.

The following is a list of related publications:

PUBLICATION	COLLINS PART NUMBER
51RV-2B VOR/ILS Receiver Maintenance Manual	523-0760758
51RV-2B VOR/ILS Receiver Overhaul Manual	522-0760757
680T-1 VHF Synthesizer Planar Assembly Overhaul Manual	523-0759575
951A-1 Glideslope Receiver Planar Assembly Overhaul Manual	523-0760760
844A-1 VOR/LOC Instrumentation Planar Assembly Overhaul Manual	523-0760756

The following is a list of unusual or uncommon abbreviations and symbols that are used throughout this manual.

SYMBOL ABBREVIATION	IDENTIFICATION
Hz	Hertz (formerly cycles per second)
VOR	Vhf omnidirectional range
VOR/LOC	Vhf omnidirectional range and/or localizer
(s+n)/n	Signal-plus-noise to noise ratio



TPO-5870-017

1051B-1 VHF NAV Receiver Planar Assembly
Figure 1

1051B-1 VHF NAV Receiver Planar Assembly - Description and Operation

1. GENERAL.

This section presents the purpose, specifications, general description, and theory of operation of the 1051B-1 VHF NAV Receiver Planar Assembly, shown in figure 1. Figure 2 is a list of the equipment covered in this manual.

EQUIPMENT	FREQUENCY RANGE	COLLINS PART NUMBER
1051B-1 VHF NAV Receiver Planar Assembly	Receives on frequencies from 108.00 through 117.95 MHz	772-0790-001 772-0790-002

Equipment Covered
Figure 2

2. PURPOSE OF EQUIPMENT.

The 1051B-1 VHF NAV Receiver Planar Assembly is that part of the 51RV-2B VOR/ILS Receiver that receives VOR/LOC signals from the vhf antenna and magnetic heading in information from the magnetic compass system.

The 1051B-1 VHF NAV Receiver provides the following outputs: aural output to the aircraft intercom, audio output to the 844A-1 VOR/LOC Instrumentation Planar Assembly, power for all 51RV-2B planar assemblies, VOR/ILS self-test signals, and an amplified magnetic heading output that operates an RMI compass card.

The mode relay, that switches VOR power to the VOR circuits and ILS power to the ILS circuits, is also contained in the 1051B-1 VHF NAV Receiver Planar Assembly.

3. EQUIPMENT SPECIFICATIONS.

Figure 3 lists the specifications for the 1051B-1 VHF NAV Receiver Planar Assembly.

CHARACTERISTIC	SPECIFICATION
Electrical specifications	
Frequency range	
VOR	108.00 to 117.95 MHz except odd-tenth frequencies from 108.1 to 111.9 MHz.
LOC	108.1 to 111.9 MHz, odd-tenth frequencies.
Channel increments	
VOR	50 kHz.
LOC	200 kHz.
Number of channels	
VOR	180.
LOC	20.
Frequency stability	Resonant frequency does not deviate from selected channel frequency by more than 0.001% under the following conditions taken one at a time: 1. The dc input voltage is varied from +22.0 to +30.25 v. 2. The ambient temperature is varied from -54 °C (-65 °F) to +55 °C (+131 °F). 3. The humidity is varied from 10 to 95% at +50 °C (+122 °F). 4. The pressure is varied from normal to that equivalent to an altitude of 55,000 ft (16.77 km). 5. The transistors are exchanged in a random manner for like transistors that are within ARINC specifications.
Intermediate frequencies	18.0 MHz and 500 kHz.
Selectivity	±22.5 kHz minimum bandwidth at 6 db; ±45 kHz maximum bandwidth at 60 db.

Equipment Specifications (Sheet 1 of 2)
Figure 3

CHARACTERISTIC	SPECIFICATION
Spurious response	80 db down minimum.
Sensitivity	
Audio channel	6 db (s+n)/n ratio for a 3-uv signal modulated 30% at 1000 Hz.
VOR channel	With a 3-uv standard VOR test signal as per RTCA paper DO-69, the indicator flag is fully masked, and satisfactory navigation performance is obtained.
Gain	A 5-uv signal modulated 30% with 1000 Hz provides 100 mw of audio output with a 600-ohm load.
Agc	Detector output does not vary more than 2 db from 20 to 100,000 uv.
Antenna input	52 ohms. Parallel operation of two VOR/LOC receivers from one antenna does not result in a loss exceeding 4 db.
Output circuits	
Audio output	600 ohms balanced and center tapped; 100-mw nominal output at 30% modulation.
Audio frequency response	Not more than 6 db variation from 300 to 3750 Hz with a 1000-uv signal modulated 30% and an initial 1000-Hz audio output of 100 mw. Sharp cutoff in response below 300 Hz and above 3750 is provided.
Audio output regulation	With 100 mw into 600 ohms, the audio power output is not less than 50 mw or more than 200 mw when load resistance is changed from 300 to 1200 ohms.

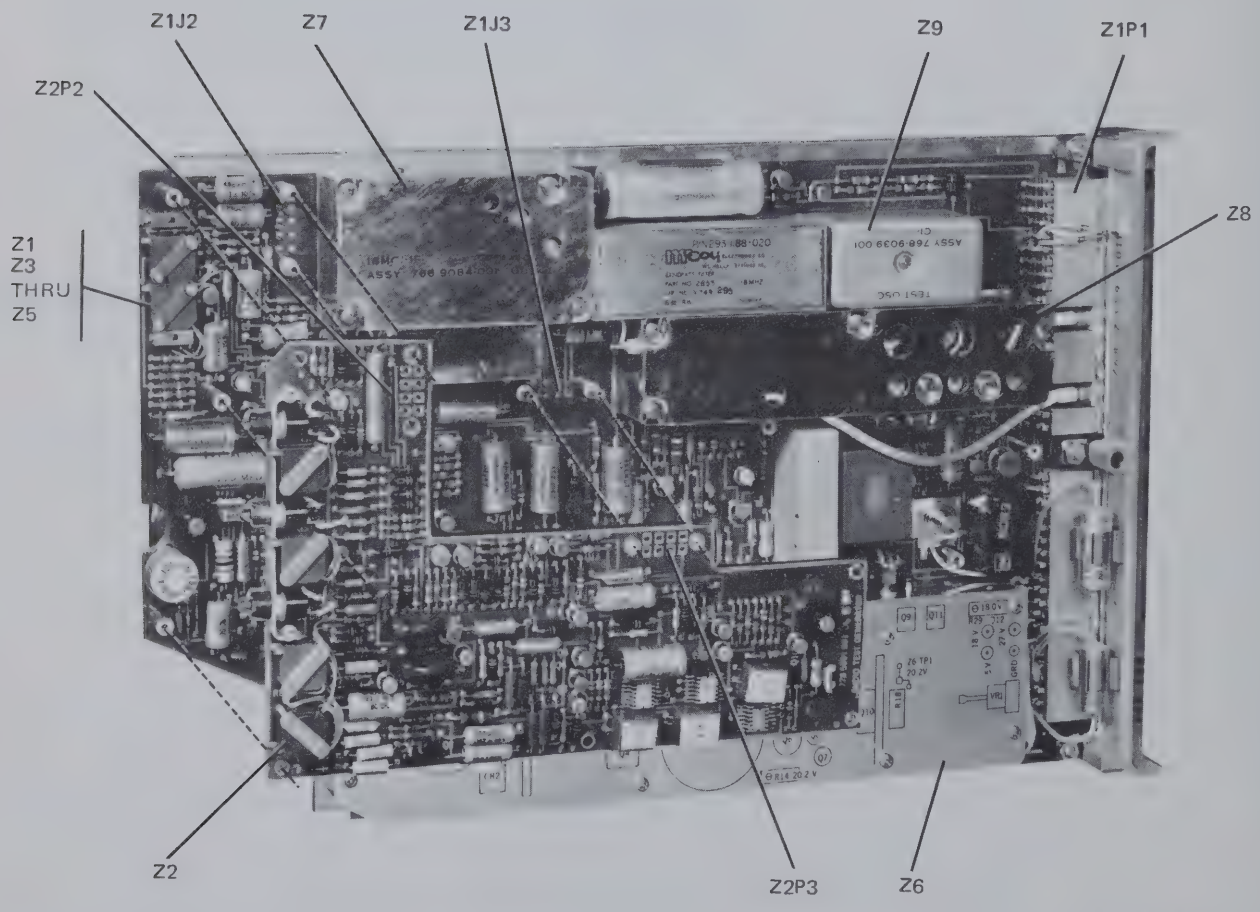
Equipment Specifications (Sheet 2 of 2)
Figure 3

4. EQUIPMENT DESCRIPTION.

A. Mechanical Description. (Refer to figure 4.)

The 1051B-1 VHF NAV Receiver Planar Assembly consists of a planar sideboard with a Collins thin-line connector mounted rigidly to the planar sideboard. A parallel mounted subassembly card (Z2) plugs directly into the sideboard.

The illustration (figure 4) shows the nomenclature scheme by which the 1051B-1 VHF NAV Receiver is organized. The planar sideboard is designated Z1 and the vertical connector attached to Z1 is designated Z1P1. Planar sideboard Z1 is further subdivided into parts Z3 through Z5 as shown by silk screening on the printed circuit side of Z1. All components in Z3 through Z5 are mounted on the planar sideboard.



1051B-1 VHF NAV Receiver Planar Assembly, Subassembly Identification (Sheet 1 of 2)
Figure 4

Z NUMBER DESIGNATION	NOMENCLATURE
Z1	Planar sideboard
Z2	Audio test generator and timer
Z3	498.5-kHz if.
Z4	RMI servo amplifier
Z5	Audio amplifier
Z6	Power supply
Z7	18-MHz if.
Z8	Vhf tuner
Z9	Test oscillator

1051B-1 VHF NAV Receiver Planar Assembly, Subassembly Identification (Sheet 2 of 2)
Figure 4

Also mounted on planar sideboard Z1 are a number of metal boxes with covers. The circuits in the metal boxes are wired directly to the circuits on Z1. Numbers Z6 through Z9 identify each metal box.

Two rows of vertical pins designated Z1J2 and Z1J3 are also attached to sideboard Z1. These vertical pins provide connections to plug-in card, Z2, which mounts parallel to Z1. Connector pins Z1J2 mate with female connector Z1P2 on board Z2. Connector pins Z1J3 mate with female connector Z2P3 on board Z2.

The entire assembly, when interconnected, is designated 1051B-1 VHF NAV Receiver Planar Assembly.

B. Electrical Description.

(1) 1051B-1 VHF NAV Receiver.

(a) VHF Tuner and IF. Circuits (Z8, Z7, and Z3).

The vhf tuner and if. circuits consist of a voltage variable capacitor tuned vhf front end followed by two if. amplifiers, a detector, and agc circuits. Tuning over the 108.00- to 117.95-MHz range is accomplished by injection

of tuning voltage from the 680T-1 VHF Synthesizer Planar Assembly. The mixed if. outputs are at 18 MHz and 498.5 kHz. The 18-MHz if. results from mixing the rf input with the VOR/LOC injection frequency from the 680T-1 VHF Synthesizer. This 18-MHz signal is reduced to 498.5 kHz by mixing the 18 MHz with an 18.4985-MHz oscillator output. The 498.5-kHz if. is detected and the output is applied to the 844A-1 VOR/LOC Instrumentation input. The output is also applied to the audio amplifier stages for filtering and shaping to produce an aural output.

(b) Audio Amplifier (Z5).

The audio amplifier provides noise limiting, response shaping, and power amplification for the audio output from the vhf tuner and if. circuits. The aural output from the audio amplifier is applied to the aircraft cockpit audio system.

(c) VOR/ILS Audio Test Generator and Timer (Z2).

The VOR/ILS self-test audio generator synthesizes VOR and ILS audio signals that are applied to the self-test oscillators in each receiver. When the 51RV-2B is tuned to a localizer frequency (ILS mode), the test generator is energized by pressing the UP/L or DN/R test switches on the 51RV-2B front panel or on the remote control unit (separate remote switches can also be used). In the VOR mode, the self-test is energized by pressing the VOR test switch on the 51RV-2B front panel or on the remote control unit.

(d) RMI Servo Amplifier (Z4).

The RMI servo amplifier receives low-level magnetic heading information from the magnetic compass system and amplifies this signal to a level sufficient to drive the RMI compass card.

(e) Power Supply (Z6).

The 51RV-2B power supply uses +27.5-volt dc aircraft power to provide the required +18- and +5-volt regulated dc power.

(f) VOR/LOC Mode Relay (Part of Z1).

The VOR/LOC mode relay switches VOR power to VOR circuits when the 51RV-2B is tuned to a VOR frequency, and ILS power to ILS circuits when the 51RV-2B is tuned to a localizer frequency. A +27.5 glideslope power output is also applied to the rear connector of the interconnect unit when the 51RV-2B is tuned to a localizer frequency (ILS mode).

(2) Controls.

Controls are divided into two types; adjustment controls and alignment controls. The adjustment controls are the potentiometers, and except for two potentiometers in the power supply, are all accessible after the 51RV-2B front panel has

been removed. It is not necessary to remove the dust cover to obtain access to the potentiometers. The alignment controls consist of the variable capacitors and coils in the rf stages. These controls are accessible only after the 1051B-1 VHF NAV Receiver has been removed from the dust cover.

Figure 5 lists all adjustment controls and describes the function of each.

CONTROL	FUNCTION
VHF NAV receiver	
AUD LVL (Z5R6)	Controls signal level applied to audio amplifier.
VOR TEST (Z251)	Initiates VOR self-test of 51RV-2B.
LOC BAL (Z2R70)	Controls 90/150-Hz tone ratio of composite localizer self-test signal.
LOC LVL (Z2R79)	Controls level of composite localizer test signal applied to vhf NAV receiver.
VHF DET (Z3R9)	Controls output level of detected vhf signal.
UP/L (Z2S2)	Initiates ILS up/left self-test of 51RV-2B.
GS BAL (Z2R75)	Controls 90/150-Hz tone ratio of composite glideslope self-test signal.
GS LVL (Z2R78)	Controls level of composite glideslope test signal applied to glideslope receiver planar assembly.
DN/R (Z2S3)	Initiates ILS down/right self-test of 51RV-2B.
VOR ZERO (Z2R33)	Controls phase relationship between 30-Hz amplitude modulation and 30-Hz frequency modulation of 9960-Hz VOR self-test signal.
30 HZ LVL (Z2R86)	Controls level of the 30-Hz signal which modulates the 9960-Hz multivibrator output.
900 FREQ (Z2R5)	Controls the frequency of the 900-Hz multivibrator output.
9960 FREQ (Z2R27)	Controls the frequency of the 9960-Hz multivibrator output.

Adjustment Controls (Sheet 1 of 2)
Figure 5

CONTROL	FUNCTION
20.2 V (Z6R14)	Adjusts output of power supply preregulator.
18.0 V (Z6R29)	Adjusts output of power supply.

Adjustment Controls (Sheet 2 of 2)
Figure 5

5. THEORY OF OPERATION.

A. General.

The theory of operation for the 1051B-1 VHF NAV Receiver includes block diagram theory of the 1051B-1 VHF NAV Receiver, and detailed circuit theory of the vhf tuner, if. circuits, audio amplifier, VOR/ILS audio test generator and timer, RMI servo amplifier, and 51RV-2B power supply.

B. Block Diagram Theory of Operation.

(1) VHF Tuner and IF. Circuits. (Refer to figure 6.)

The vhf antenna input is applied to a 3-pole, minimum loss, rf tuned filter which is tuned by a dc tuning voltage applied from the vhf synthesizer to voltage variable capacitors in the filter. The output of the rf filter is applied to field-effect transistor (fet) first mixer, Z8Q1 and Z8Q2, where it is mixed with the 126.00- to 135.95-MHz injection output of the vhf synthesizer. The difference signal is applied to 18-MHz crystal filter FL1. The 18-MHz output of FL1 is coupled through LC matching network L1, C1 to agc-controlled amplifiers Z7Q1 and Z7Q2 to produce an 18-MHz if. output.

The 18-MHz if. is applied to second mixer Z7Q4 where it is mixed with the 18.4985-MHz injection from local oscillator Z7Q3. At the mixer output is fixed tuned bandpass filter FL2 tuned to 498.5 kHz. Following the filter is 3-stage, RC coupled, 498.5-kHz if. amplifier, Z3Q1, Z3Q2, and Z3Q3. This 3-stage if. amplifier increases the signal to the desired level. The 498.5-kHz if. amplifier output is transformer coupled to detector Z3CR1. The detected audio from Z3CR1 is applied to isolation amplifiers Z3Q4 and Z3Q5. Isolation amplifiers Z3Q4 and Z3Q5 provide audio for the audio amplifier, audio for the VOR and the localizer instrumentation units, and an input to the agc circuit.

The agc reference is provided by division of +18 volts dc by Z3R31 and Z3R32. When the detected rf from detector Z3CR1 decreases, the agc differential amplifier (Z3Q6, Z3Q7, Z3Q10, Z3Q11) provides an output through agc output amplifier Z3Q8 to increase the gain of the if. amplifiers. When the detected rf from detector Z3CR1 increases, the agc differential amplifier provides an output through agc output amplifier Z3Q8 to decrease the gain of the if. amplifiers.

A NAV disable input is applied to disable the agc output amplifier whenever the 51RV-2B is tuned to a frequency other than a NAV frequency. The NAV disable input is inverted by Z1Q2 and applied to if. disable Z1Q4 and tuning voltage disable Z1Q3. If. disable Z1Q4 saturates and grounds the agc reference level causing loss of agc and disabling the if. stages. Tuning voltage disable Z1Q3 also saturates and the dc tuning voltage applied from the vhf synthesizer is applied to ground.

(2) Audio Amplifier, Z5. (Refer to figure 6.)

The amplified output from the vhf NAV receiver detector is applied to input emitter follower Q1 in the audio amplifier for power gain and minimum loading of the vhf NAV receiver detector. From this input amplifier, the audio signal is applied to the response shaping network and audio amplifiers.

Audio bandpass filter FL1 shapes the response by attenuating 90- and 150-Hz localizer signals and the 9960-Hz subcarrier on VOR. The output from the bandpass filter, containing frequencies exclusive of VOR/LOC frequencies, is applied to audio amplifiers Q2 and Q3 and a phase splitter network containing Q4. Power amplifier drivers Q5 and Q6 apply the output to a push-pull output stage consisting of Q7 and Q8. The output amplifiers bring the 51RV-2B VOR/ILS Receiver aural output up to the required power level for the aircraft intercom system..

(3) VOR/ILS Audio Test Generator and Timer, Z2. (Refer to figure 6.)

A self-test generator provides simulated VOR, localizer, and glideslope audio signals to modulate the VOR/LOC rf self-test oscillator in the vhf NAV receiver planar assembly and the glideslope rf self-test oscillator in the glideslope receiver planar assembly. Sine-wave, phase-locked, 30-, and 9960-Hz frequency modulated at 30-Hz signals are required in the VOR test mode. A 900-Hz audio signal is also provided for checking the audio amplifier stage in the 1051B-1 VHF NAV Receiver. Square-wave, phase-locked, 90- and 150-Hz signals are required in the ILS test mode.

Assume that the 51RV-2B is in ILS mode (LOC frequency selected). This condition permits operation of ILS self-tests. The DN/R and UP/L pushbutton test switches on the 51RV-2B front panel or the remote DN/R and UP/L test switches on the cockpit control unit initiate the respective ILS tests when actuated. Upon initiating an ILS test, the VOR/LOC and glideslope flags drop into view for approximately 3 seconds and then are retracted for 20 seconds. The glideslope pointer shows a predetermined up (up/left test) or down (down/right test) indication and the VOR/LOC deviation bar shows a predetermined left (up/left test) or right (down/right test) indication (75 ua or 2-1/2 dots). If, after 20 seconds, the test initiate signal remains (test switch still actuated), the VOR/LOC and glideslope flags return to view, thereby preventing the pilot from flying on test commands should failure occur. Also, all of the 51RV-2B monitoring circuits are functioning normally during self-test. Any malfunction or failure that occurs during the 20-second self-test period will cause the respective VOR/LOC or glideslope flag(s) to come into view.

With the 51RV-2B tuned to an ILS frequency, the VOR/LOC mode relay is energized. ILS power is switched to all ILS circuits and +18 volts dc is switched to

ILS circuits in the test generator and timer. This dc ILS input is applied to test request initiate Q15, down/right test Q16, up/left test Q17, and to the timer enable ORing circuit. As long as no ILS test switch is actuated, the output of the timer enable ORing circuit inhibits operation of 3-second timer Q11 and transistors Q15-Q17 remain saturated. Upon actuating either a DN/R or UP/L test initiate switch, a ground is applied to the cathode of CR16 or CR17 respectively. The dc ILS input is removed, thereby inhibiting test request initiate Q15 and Q16 (DN/R test switch engaged) or Q17 (UP/L test switch engaged). Down/right test Q16 and up/left test Q17 apply outputs to the glideslope/localizer combiner. These two inputs to the glideslope/localizer combiner place the combiner in a down/right test configuration or up/left test configuration respectively. The output of the timer enable ORing circuit is also removed when one of the ILS test initiate switches is engaged. Three-second timer operation begins.

Assuming the 51RV-2B to be in VOR mode (VOR frequency selected), a VOR test is initiated by actuating the VOR test switch on the 51RV-2B front panel or the VOR test initiate switch on the remote control unit. Upon initiating a VOR test, the VOR/LOC flag drops into view for at least 3 seconds and up to 9 seconds (depending on the slew time of the RMI) and then is retracted for from 14 to 20 seconds (depending on the slew time of the RMI). The RMI pointer rotates to 180 degrees, and the VOR/LOC deviation indicator is centered. The VOR/LOC flag will return to view, if, after 14 to 20 seconds, the test initiate signal remains.

With the 51RV-2B tuned to a VOR frequency, the VOR/LOC mode relay is unenergized. VOR power is switched to all VOR circuits and +18 volts dc is switched to VOR circuits in the test generator and timer. This dc VOR input is applied to test request initiate Q15 and to the timer enable ORing circuit. As long as no VOR test switch is actuated, the output of the timer enable ORing circuit inhibits operation of 3-second timer Q-1 and test request initiate Q15 remains saturated. When a VOR test switch is actuated, VOR timer enable CR18 is forward biased and the +18 volts dc VOR is removed to ground. The output of the timer enable ORing circuit is removed, causing the 3-second timer to begin operating. Test request initiate Q15 is inhibited allowing 20-second timer Q14 to control flag enable Q13.

Assume that a test switch is actuated. With test request initiate Q15 inhibited, the base and collector voltage of flag enable transistor Q13 are equal, and Q13 is inhibited. The flag enable output from flag enable Q13 to the glideslope flag logic and driver and the VOR/LOC flag logic and driver is removed, causing the respective flags to show. Loss of output from the timer enable ORing circuit causes capacitor discharge in the 3-second timer network. After 3 seconds of discharge, the bias voltage on transistor Q11 enables 3-second timer Q11. The voltage developed across the output load of Q11 enables test enable control Q10, which enables test enable Q9. The test enable +18-volt dc output is applied to 20-second timer Q14 and to the 900-Hz multivibrator. The test enable signal disables 20-second timer Q14 for a 20-second interval. When Q14 is disabled, the base voltage on flag enable Q13 drops, thereby enabling Q13 and replacing the flag enable signal. This flag enable signal is applied to the 3-second timer network, holding the timer off when a test is not initiated and working in conjunction with 3-second timer hold switch Q15 to hold the 3-second timer on during test. If after 20 seconds the test initiate signal remains, Q14 again saturates and flag

enable Q13 is again inhibited, removing the flag enable signal and returning the flags to view.

The test enable +18 volts dc applied to the 900-Hz multivibrator starts oscillation of the astable multivibrator which supplies a 900-Hz output to three counter networks. Counter A1 divides the 900-Hz input by six to produce a 150-Hz square wave. Counter A2 works with counter A7 to produce a 90-Hz square wave, and also works with counter A3 to produce a 30-Hz square wave. The square-wave output of counter A3 is differentiated and applied to sync trigger A11. The output of sync trigger A11 synchronizes the 150-Hz square-wave output and 90-Hz square-wave output to the 30-Hz square-wave output.

The 150-, 90-, and 30-Hz signals are applied to inverter network A12. This inverter network prevents loading of the counters.

The three output signals are amplified in amplifiers Q3, Q4, and Q5. The 90- and 150-Hz square waves are combined in the glideslope/localizer combiner to form the up/left or down/right ILS test signals. The self-test glideslope audio is applied to the glideslope receiver self-test oscillator/modulator directly from the combiner. The self-test localizer audio is applied through CR25 (CR26 is reverse biased by +18 volts dc ILS) to the VOR/LOC receiver self-test oscillator/modulator.

The 30-Hz VOR signal is synthesized in the RC combiner from the 30-, 90-, and 150-Hz square waves used in the ILS mode. The 30 Hz is applied to modulator Q6, which drives 9960-Hz multivibrator Q7 and Q8. The VOR signal output from the 9960-Hz multivibrator is a frequency-modulated signal with a 30-Hz amplitude modulation component. This signal obtains a 900-Hz audio component from 900-Hz amplifier Q18 and is then applied through CR26 (CR25 is reverse biased by +18 volts dc VOR) to the self-test oscillator/modulator in the 1051B-1 VHF NAV Receiver.

(4) RMI Servo Amplifier Z4. (Refer to figure 6.)

The RMI servo amplifier steps up magnetic heading information from the magnetic compass system to a level sufficient to drive the RMI compass card. Input C' is applied to the secondary of rate feedback transformer T1 and coupled through to the base of driver Q1. Input H' is applied to the base of driver Q2. Drivers Q1 and Q2 are connected in a push-pull configuration and apply outputs to the primary of 400-Hz tuned transformer T2. The 400-Hz output is further amplified by RMI amplifiers Q3 and Q4 before being applied to the output bridge circuit. The bridge circuit provides the output to drive the RMI compass card and also applies feedback to rate feedback transformer T1. The feedback is used to damp compass card rotation and prevent overshoot.

(5) 51RV-2B Power Supply Z6. (Refer to figure 6.)

(a) +18-Volt DC Output.

The 51RV-2B +18-volt dc output requirement is obtained with a +20.2-volt switching preregulator followed by a +18-volt series regulator.

Capacitors C7, C8, C9, and C11 and resistor R31 form the input filter network that suppresses incoming high-frequency transients and prevents switching transients from being conducted back to the input.

The +20.2-volt switching preregulator consists of Q3, Q8, Q7, Q5, Q6, and Q4. When power is applied, switch Q3 will pass enough current to be sensed by current sensor Q8. This will enable reference amplifier Q7, changing the state of the timing multivibrator (Q5-Q6), and causing Q6 to saturate. Saturation of Q6 will enable switch driver Q4, driving it into saturation, thus causing switch Q3 to saturate. When the current passed by Q3 reaches 3 amperes, current sensor Q8 supplies current to Q7, disabling Q7, which turns off Q6, Q4, and Q3. Switch Q3 remains off for a few microseconds, determined by the current to Q7 and the timing multivibrator (Q5-Q6), and then turns on again, repeating the cycle until the output of the switching preregulator is +20.2 volts. The on and off time of switch Q3 is regulated to maintain the output at +20.2 volts for inputs varying +21 to +30 volts. The current sensor network limits the current output of the switching preregulator to a maximum of 3 amperes. This protects both regulators from short circuits and overloads.

The output of Q10, an emitter follower, is monitored by reference amplifier Q12 which supplies the base current for amplifier Q11; Q11 in turn supplies the base current for driver Q9. The rate of conduction of Q9 regulates the base voltage of Q10 and, thus, its emitter output which is regulated at +18.0 volts.

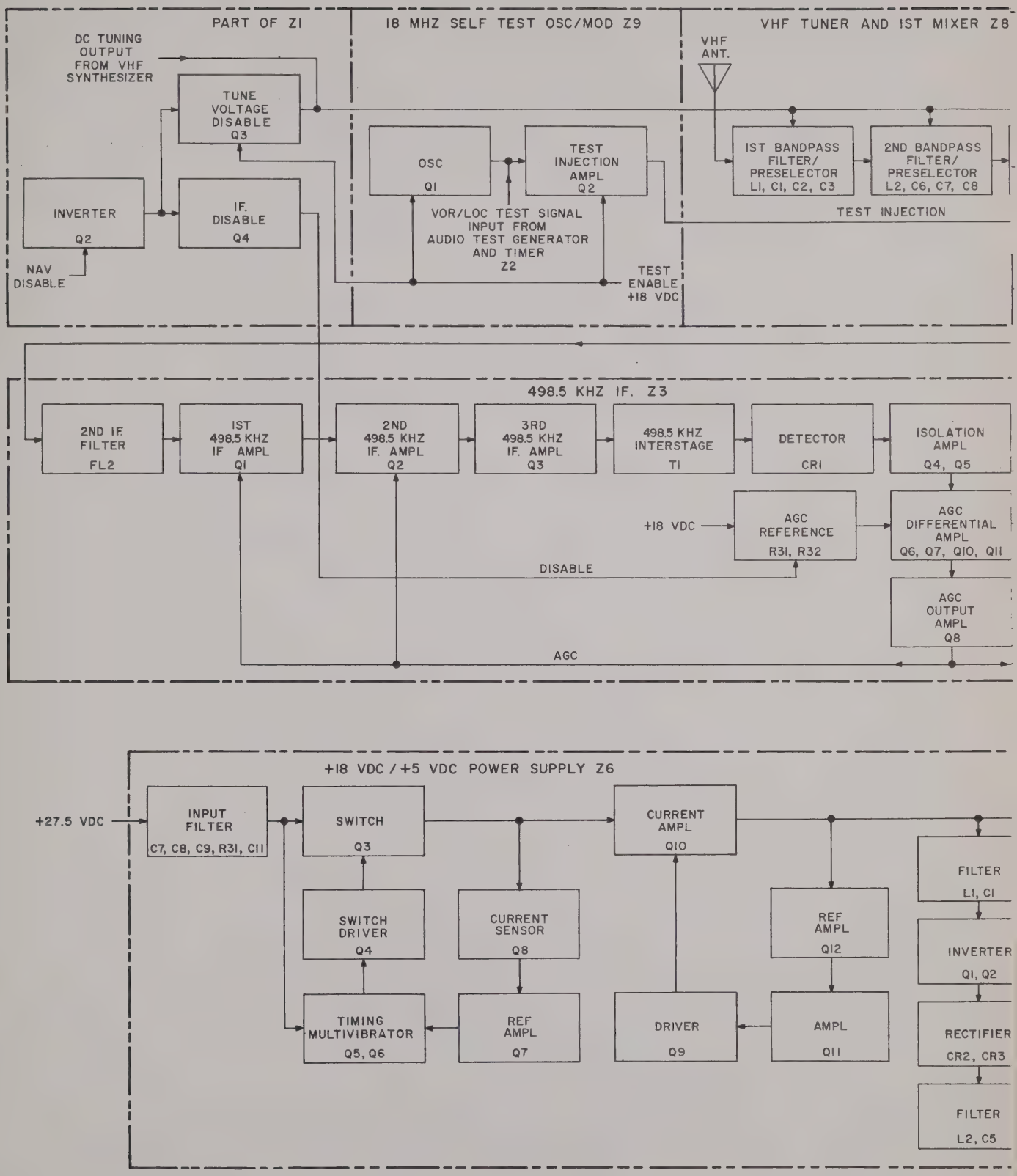
(b) +5-Volt DC Output.

The +5-volt output is provided by a dc-to-ac inverter and rectified by a full-wave rectifier, producing a ripple-free output.

Regulated +18 volts dc is applied through an isolation filter consisting of L1 and C1 to the primary of transformer T1. Transistors Q1 and Q2 and transformer T1 change the +18 volts dc into a 20-kHz square wave. This ac voltage is stepped down by the secondary of T1 and rectified into dc by full-wave rectifiers CR2 and CR3. The +5-volt dc output is filtered by L2 and C5.

(6) VOR/LOC Mode Relay Z1. (Refer to figure 6.)

The VOR/LOC mode relay switches VOR power to VOR circuits when the 51RV-2B is in VOR mode (VOR frequency selected) and ILS power to ILS circuits when the 51RV-2B is in ILS mode (localizer frequency selected). The VOR mode enable ANDing circuit consisting of CR2 and CR3 has VOR/ILS mode input and a NAV disable input. When both inputs are at logic 1 (VOR frequency selected), switch Q1 is inhibited and relay K1 is unenergized; VOR power is switched to VOR circuits in the 51RV-2B. When either the VOR/ILS logic or NAV disable input is at logic 0 (localizer frequency selected or a frequency out of NAV range selected), switch Q1 is saturated and relay K1 is energized; ILS power is switched to ILS circuits in the 51RV-2B.


PART OF Z1
18 MHZ SELF TEST OSC/MOD Z9
VHF TUNER AND IST MIXER Z8
DC TUNING OUTPUT FROM VHF SYNTHESIZER
TUNE VOLTAGE DISABLE Q3
INVERTER Q2
IF. DISABLE Q4
NAV DISABLE
OSC Q1
TEST INJECTION AMPL Q2
VOR/LOC TEST SIGNAL INPUT FROM AUDIO TEST GENERATOR AND TIMER Z2
TEST ENABLE +18 VDC
VHF ANT.
IST BANDPASS FILTER/ PRESELECTOR L1, C1, C2, C3
2ND BANDPASS FILTER/ PRESELECTOR L2, C6, C7, C8
TEST INJECTION
498.5 KHZ IF. Z3
2ND IF FILTER FL2
IST 498.5 KHZ IF AMPL Q1
2ND 498.5 KHZ IF. AMPL Q2
3RD 498.5 KHZ IF. AMPL Q3
498.5 KHZ INTERSTAGE T1
DETECTOR CR1
ISOLATION AMPL Q4, Q5
+18 VDC
AGC REFERENCE R31, R32
AGC DIFFERENTIAL AMPL Q6, Q7, Q10, Q11
DISABLE
AGC OUTPUT AMPL Q8
AGC
+18 VDC / +5 VDC POWER SUPPLY Z6
+27.5 VDC
INPUT FILTER C7, C8, C9, R31, C11
SWITCH Q3
CURRENT AMPL Q10
SWITCH DRIVER Q4
CURRENT SENSOR Q8
REF AMPL Q12
TIMING MULTIVIBRATOR Q5, Q6
REF AMPL Q7
DRIVER Q9
AMPL Q11
FILTER L1, C1
INVERTER Q1, Q2
RECTIFIER CR2, CR3
FILTER L2, C5

1051B-1 VHF NAV Receiver Planar Assembly, Block Diagram (Sheet 1 of 2)
Figure 6

Capacitors C7, C8, C9, and C11 and resistor R31 form the input filter network that suppresses incoming high-frequency transients and prevents switching transients from being conducted back to the input.

The +20.2-volt switching preregulator consists of Q3, Q8, Q7, Q5, Q6, and Q4. When power is applied, switch Q3 will pass enough current to be sensed by current sensor Q8. This will enable reference amplifier Q7, changing the state of the timing multivibrator (Q5-Q6), and causing Q6 to saturate. Saturation of Q6 will enable switch driver Q4, driving it into saturation, thus causing switch Q3 to saturate. When the current passed by Q3 reaches 3 amperes, current sensor Q8 supplies current to Q7, disabling Q7, which turns off Q6, Q4, and Q3. Switch Q3 remains off for a few microseconds, determined by the current to Q7 and the timing multivibrator (Q5-Q6), and then turns on again, repeating the cycle until the output of the switching preregulator is +20.2 volts. The on and off time of switch Q3 is regulated to maintain the output at +20.2 volts for inputs varying +21 to +30 volts. The current sensor network limits the current output of the switching preregulator to a maximum of 3 amperes. This protects both regulators from short circuits and overloads.

The output of Q10, an emitter follower, is monitored by reference amplifier Q12 which supplies the base current for amplifier Q11; Q11 in turn supplies the base current for driver Q9. The rate of conduction of Q9 regulates the base voltage of Q10 and, thus, its emitter output which is regulated at +18.0 volts.

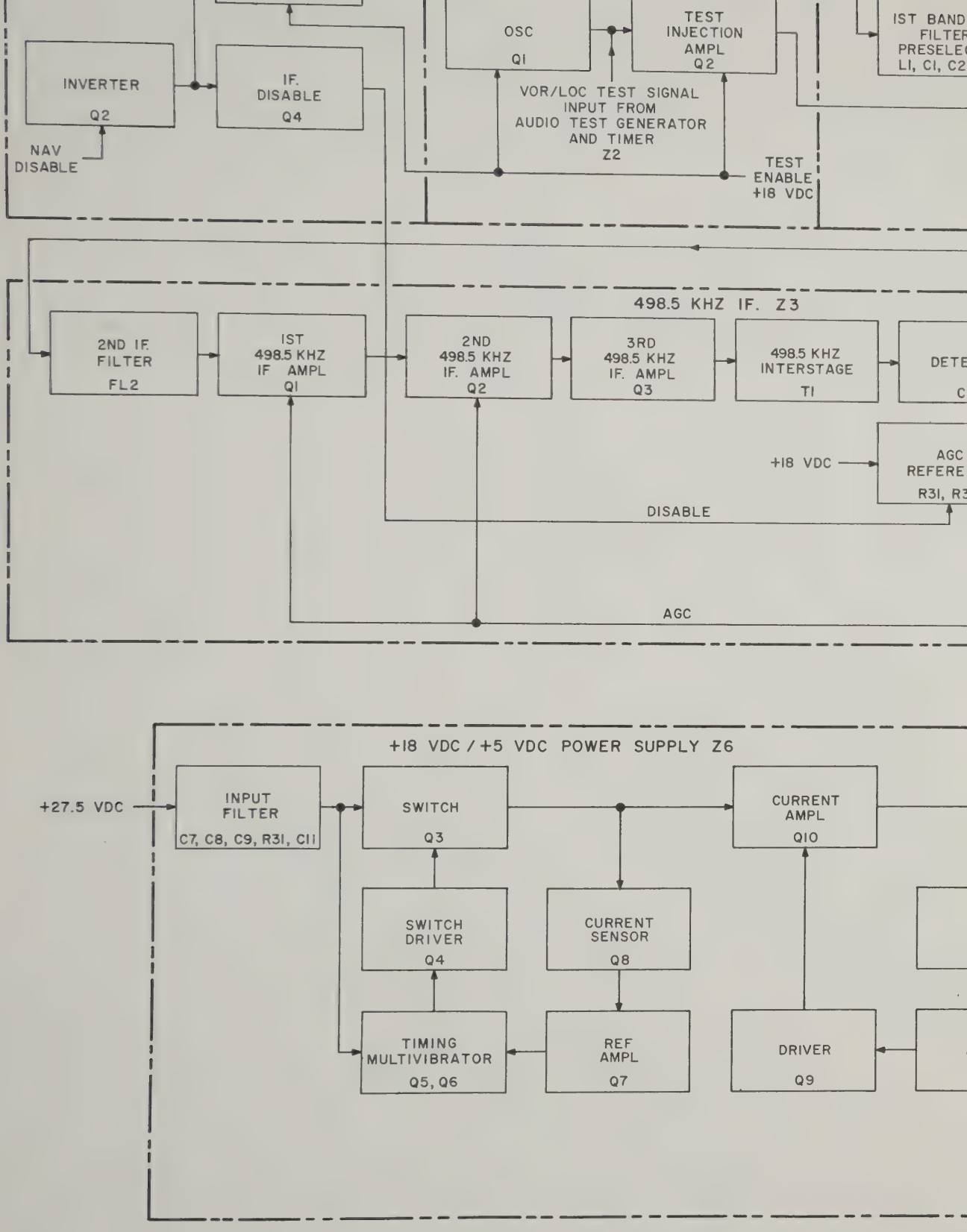
(b) +5-Volt DC Output.

The +5-volt output is provided by a dc-to-ac inverter and rectified by a full-wave rectifier, producing a ripple-free output.

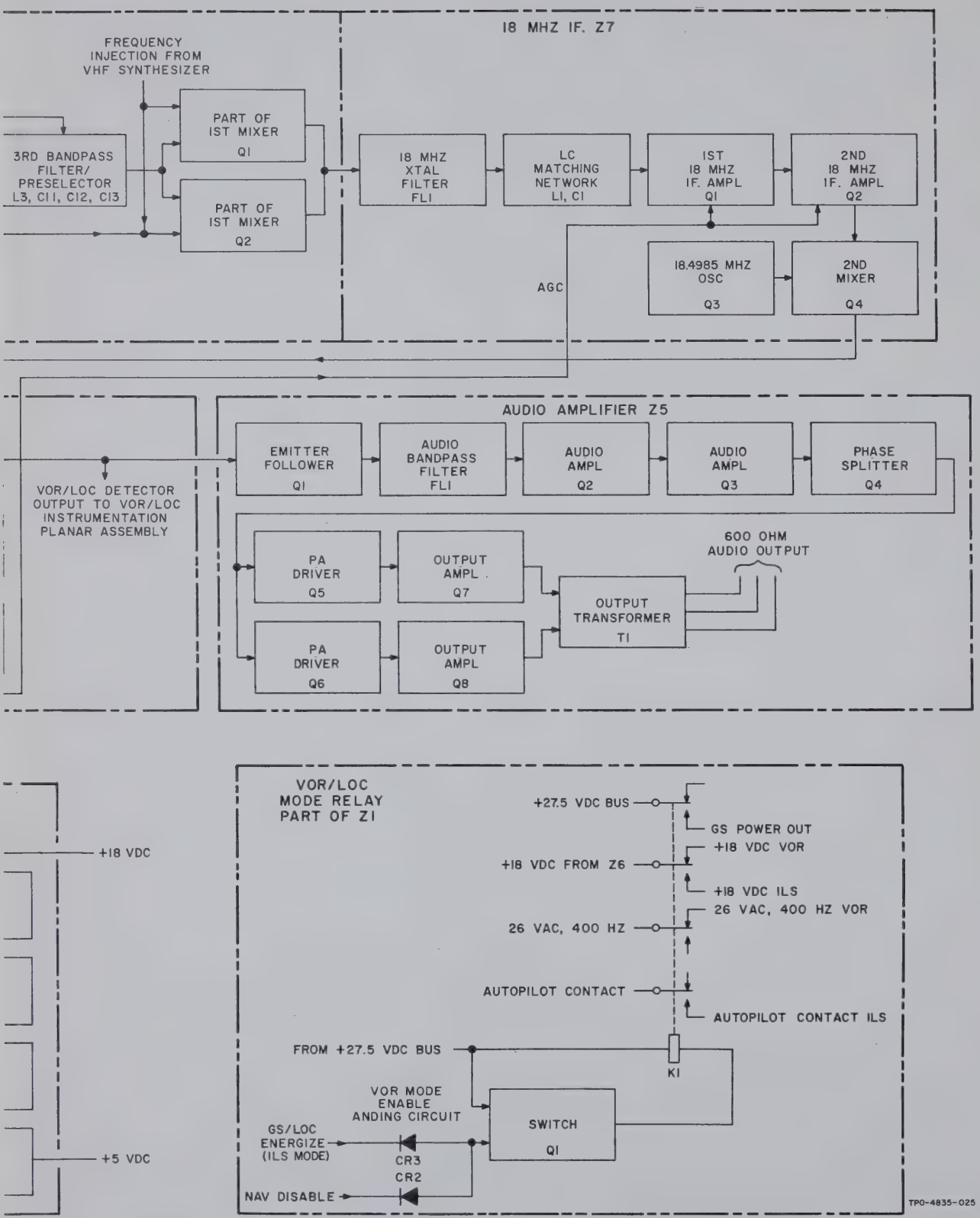
Regulated +18 volts dc is applied through an isolation filter consisting of L1 and C1 to the primary of transformer T1. Transistors Q1 and Q2 and transformer T1 change the +18 volts dc into a 20-kHz square wave. This ac voltage is stepped down by the secondary of T1 and rectified into dc by full-wave rectifiers CR2 and CR3. The +5-volt dc output is filtered by L2 and C5.

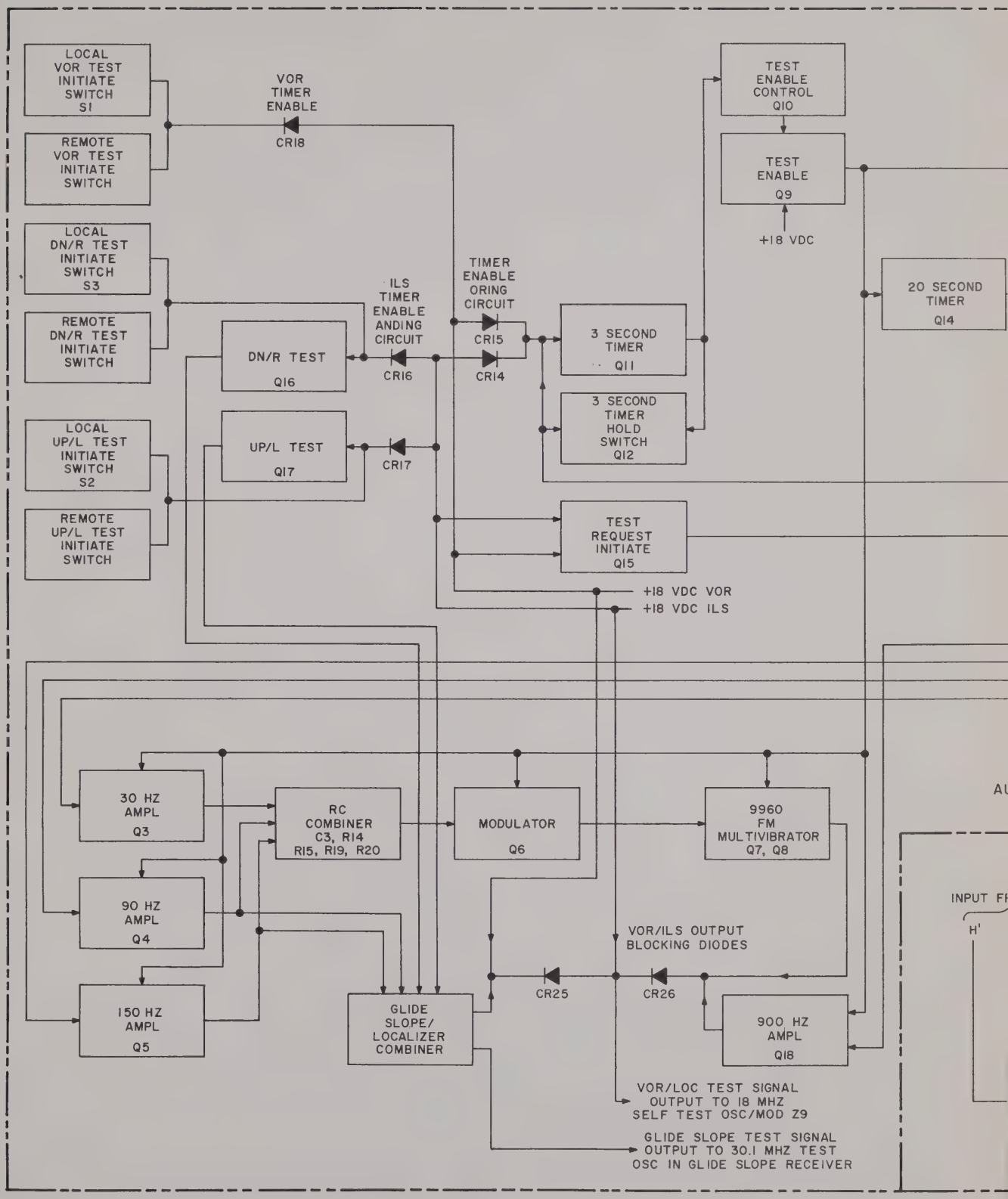
(6) VOR/LOC Mode Relay Z1. (Refer to figure 6.)

The VOR/LOC mode relay switches VOR power to VOR circuits when the 51RV-2B is in VOR mode (VOR frequency selected) and ILS power to ILS circuits when the 51RV-2B is in ILS mode (localizer frequency selected). The VOR mode enable ANDing circuit consisting of CR2 and CR3 has VOR/ILS mode input and a NAV disable input. When both inputs are at logic 1 (VOR frequency selected), switch Q1 is inhibited and relay K1 is unenergized; VOR power is switched to VOR circuits in the 51RV-2B. When either the VOR/ILS logic or NAV disable input is at logic 0 (localizer frequency selected or a frequency out of NAV range selected), switch Q1 is saturated and relay K1 is energized; ILS power is switched to ILS circuits in the 51RV-2B.

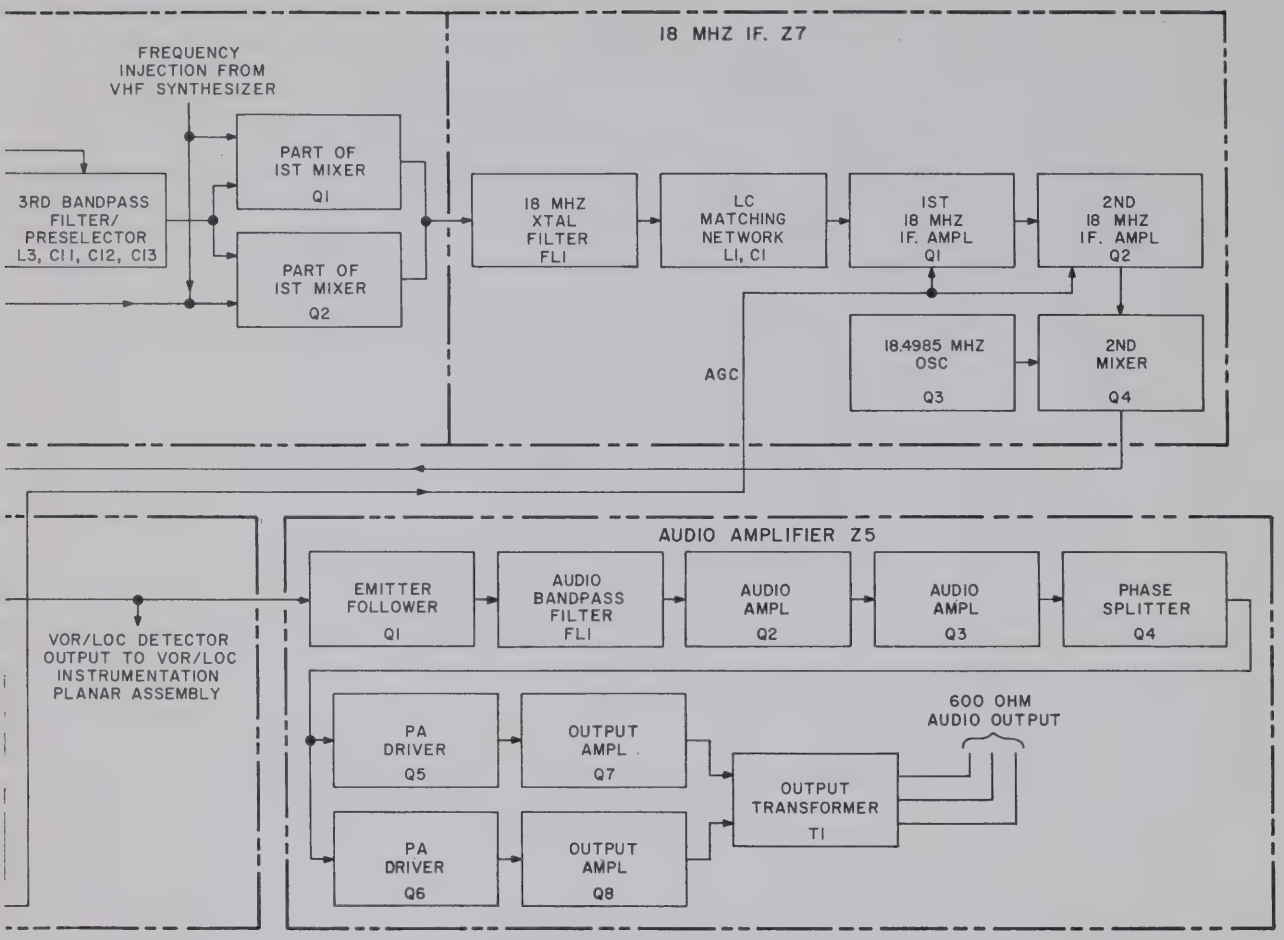


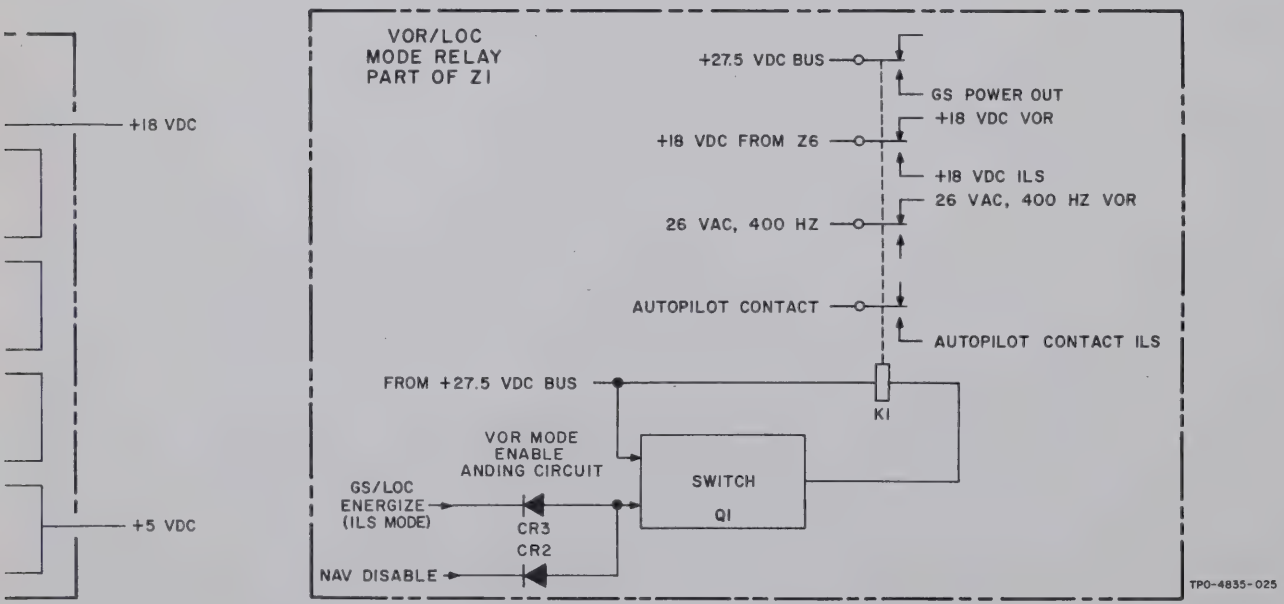
1051B-1 VHF NAV Receiver Planar Assembly, Block Diagram (Shee
Figure 6

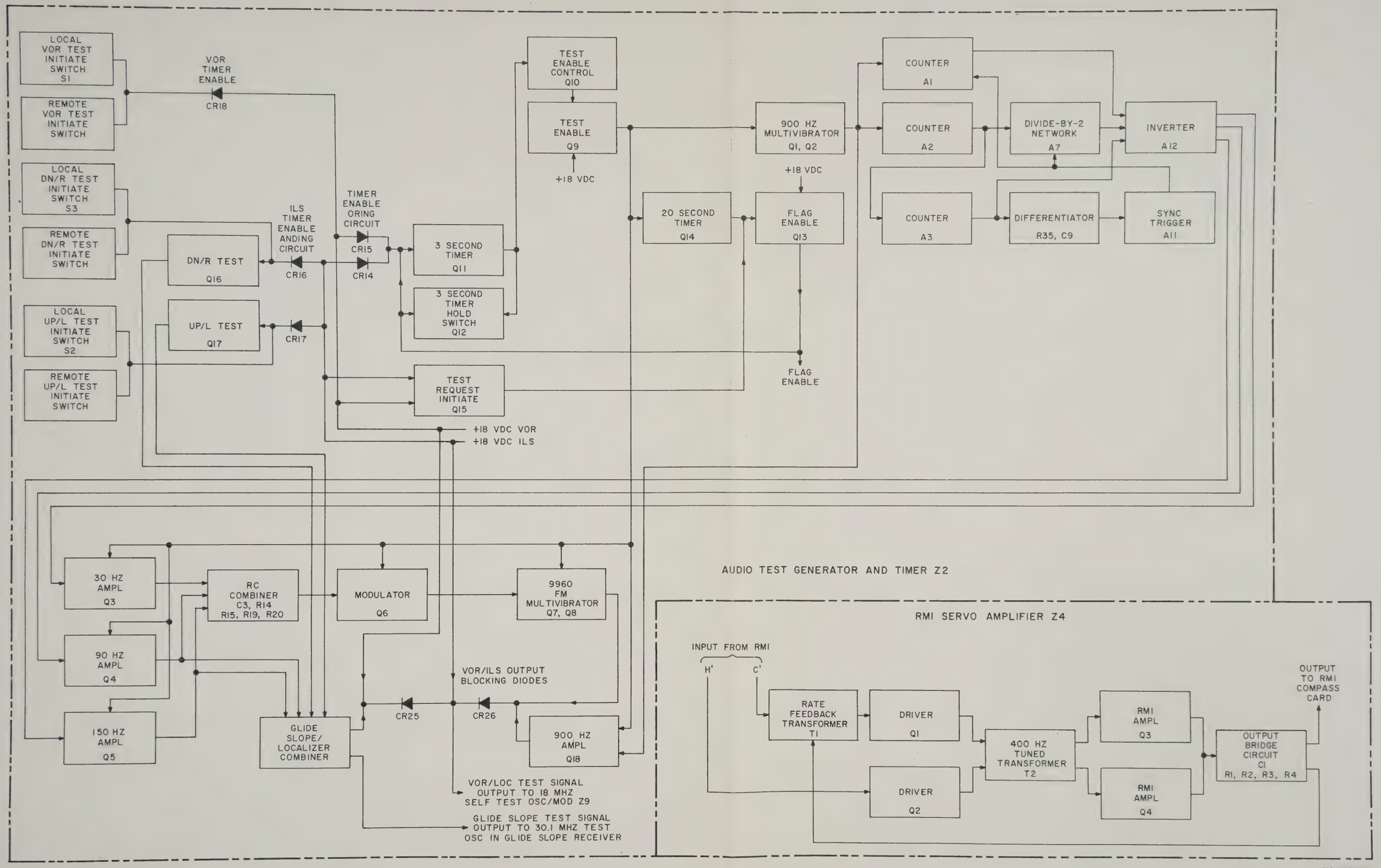

18 MHZ IF. Z7
FREQUENCY INJECTION FROM VHF SYNTHESIZER
3RD BANDPASS FILTER/ PRESELECTOR L3, C11, C12, C13
PART OF IST MIXER Q1
PART OF IST MIXER Q2
18 MHZ XTAL FILTER FL1
LC MATCHING NETWORK L1, C1
IST 18 MHZ IF. AMPL Q1
2ND 18 MHZ IF. AMPL Q2
18.4985 MHZ OSC Q3
2ND MIXER Q4
AGC
AUDIO AMPLIFIER Z5
VOR/LOC DETECTOR OUTPUT TO VOR/LOC INSTRUMENTATION PLANAR ASSEMBLY
EMITTER FOLLOWER Q1
AUDIO BANDPASS FILTER FL1
AUDIO AMPL Q2
AUDIO AMPL Q3
PHASE SPLITTER Q4
PA DRIVER Q5
PA DRIVER Q6
OUTPUT AMPL Q7
OUTPUT AMPL Q8
OUTPUT TRANSFORMER T1
600 OHM AUDIO OUTPUT
+18 VDC
+5 VDC
VOR/LOC MODE RELAY PART OF Z1
+27.5 VDC BUS
GS POWER OUT
+18 VDC VOR
+18 VDC FROM Z6
+18 VDC ILS
26 VAC, 400 HZ VOR
26 VAC, 400 HZ
AUTOPILOT CONTACT
AUTOPILOT CONTACT ILS
FROM +27.5 VDC BUS
K1
VOR MODE ENABLE ANDING CIRCUIT
SWITCH Q1
GS/LOC ENERGIZE (ILS MODE)
CR3
CR2
NAV DISABLE
TPO-4835-025


LOCAL VOR TEST INITIATE SWITCH S1
REMOTE VOR TEST INITIATE SWITCH
VOR TIMER ENABLE
CR18
TEST ENABLE CONTROL Q10
TEST ENABLE Q9
+18 VDC
LOCAL DN/R TEST INITIATE SWITCH S3
REMOTE DN/R TEST INITIATE SWITCH
ILS TIMER ENABLE ANDING CIRCUIT
TIMER ENABLE ORING CIRCUIT
CR15
CR14
CR16
DN/R TEST Q16
3 SECOND TIMER Q11
3 SECOND TIMER HOLD SWITCH Q12
20 SECOND TIMER Q14
LOCAL UP/L TEST INITIATE SWITCH S2
REMOTE UP/L TEST INITIATE SWITCH
UP/L TEST Q17
CR17
TEST REQUEST INITIATE Q15
+18 VDC VOR
+18 VDC ILS
30 HZ AMPL Q3
90 HZ AMPL Q4
150 HZ AMPL Q5
RC COMBINER C3, R14 R15, R19, R20
MODULATOR Q6
9960 FM MULTIVIBRATOR Q7, Q8
VOR/ILS OUTPUT BLOCKING DIODES
CR25
CR26
GLIDE SLOPE/ LOCALIZER COMBINER
900 HZ AMPL Q18
VOR/LOC TEST SIGNAL OUTPUT TO 18 MHZ SELF TEST OSC/MOD Z9
GLIDE SLOPE TEST SIGNAL OUTPUT TO 30.1 MHZ TEST OSC IN GLIDE SLOPE RECEIVER

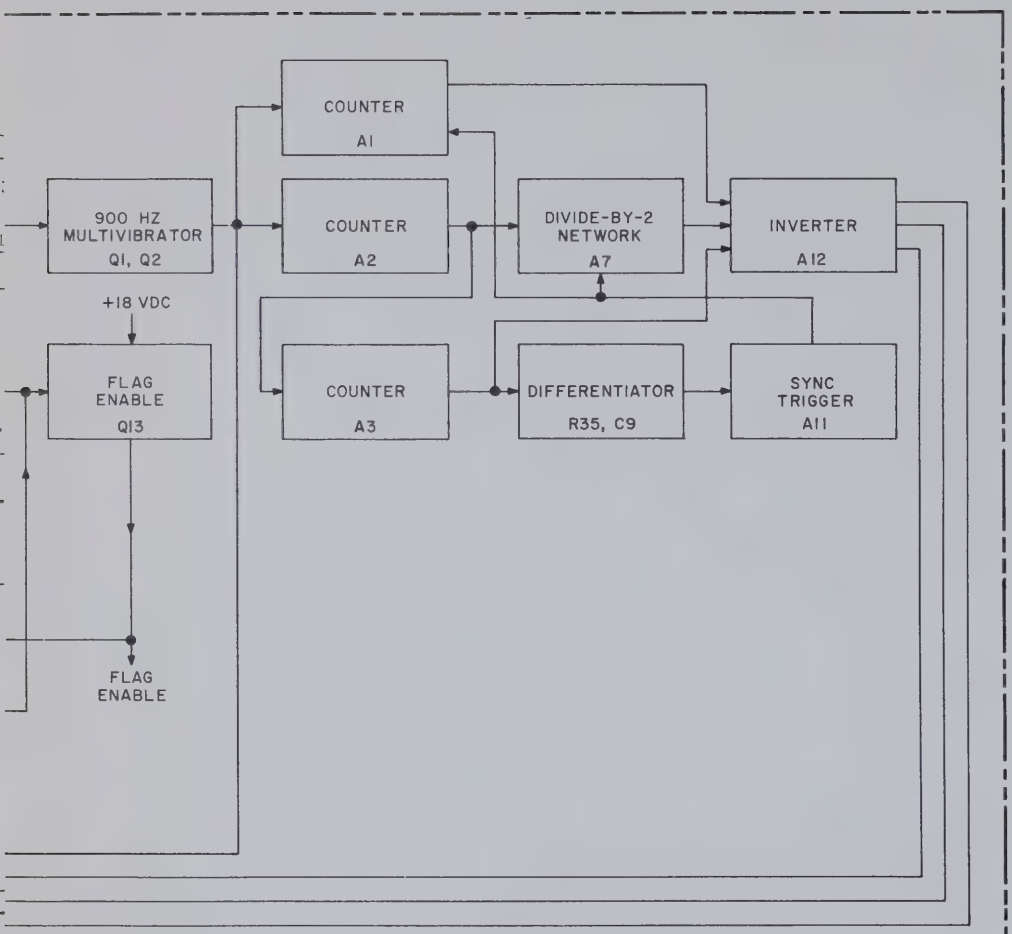
1051B-1 VHF NAV Receiver Planar Assembly, Block Diagram (Sheet 2 of 2)
Figure 6


18 MHZ IF. Z7
FREQUENCY INJECTION FROM VHF SYNTHESIZER
3RD BANDPASS FILTER/ PRESELECTOR L3, C11, C12, C13
PART OF 1ST MIXER Q1
PART OF 1ST MIXER Q2
18 MHZ XTAL FILTER FL1
LC MATCHING NETWORK L1, C1
1ST 18 MHZ IF. AMPL Q1
2ND 18 MHZ IF. AMPL Q2
AGC
18.4985 MHZ OSC Q3
2ND MIXER Q4
AUDIO AMPLIFIER Z5
VOR/LOC DETECTOR OUTPUT TO VOR/LOC INSTRUMENTATION PLANAR ASSEMBLY
EMITTER FOLLOWER Q1
AUDIO BANDPASS FILTER FL1
AUDIO AMPL Q2
AUDIO AMPL Q3
PHASE SPLITTER Q4
PA DRIVER Q5
PA DRIVER Q6
OUTPUT AMPL Q7
OUTPUT AMPL Q8
OUTPUT TRANSFORMER T1
600 OHM AUDIO OUTPUT

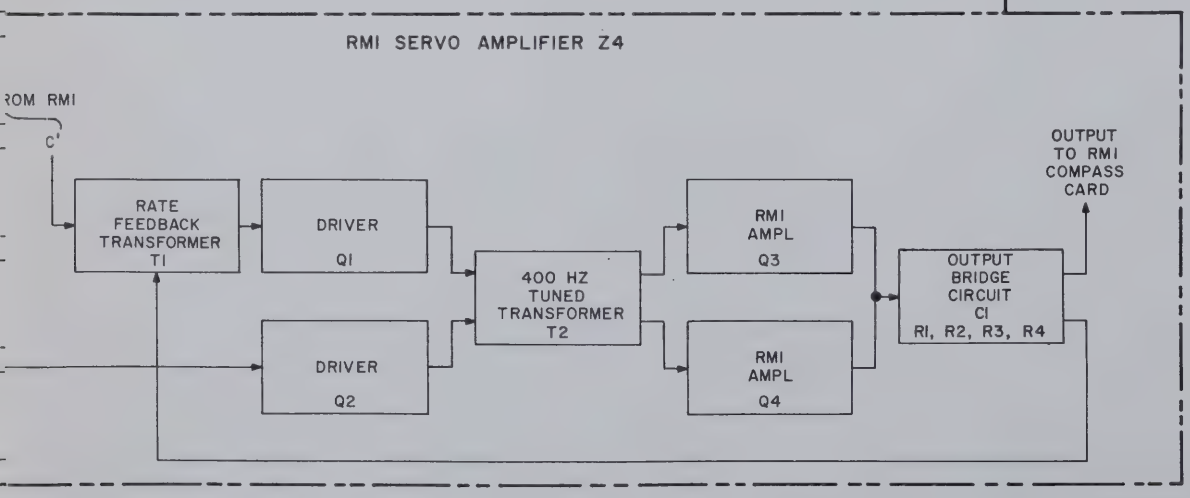

+18 VDC
+5 VDC
VOR/LOC MODE RELAY PART OF Z1
+27.5 VDC BUS
GS POWER OUT
+18 VDC VOR
+18 VDC FROM Z6
+18 VDC ILS
26 VAC, 400 HZ VOR
26 VAC, 400 HZ
AUTOPILOT CONTACT
AUTOPILOT CONTACT ILS
FROM +27.5 VDC BUS
K1
VOR MODE ENABLE ANDING CIRCUIT
SWITCH Q1
GS/LOC ENERGIZE (ILS MODE)
CR3
CR2
NAV DISABLE
TP0-4835-025



1051B-1 VHF NAV Receiver Planar Assembly, Block Diagram (Sheet 2 of 2)
Figure 6



JDIO TEST GENERATOR AND TIMER Z2



TPO-4835-025

C. Detailed Theory of Operation.

(1) General.

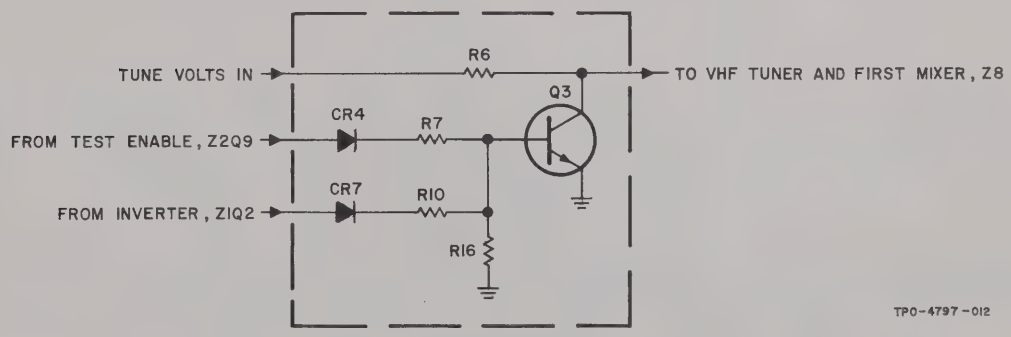
The 1051B-1 VHF NAV Receiver Planar Assembly receives VOR signals in the 108.00- to 117.95-MHz frequency range except on the odd-tenth frequencies from 108.1 to 111.9 MHz; LOC signals are received on these odd-tenth frequencies. The VOR frequencies are tunable in 50-kHz increments over 180 channels and the LOC frequencies in 200-kHz increments over 20 channels.

Dual conversion is used in the 1051B-1 VHF NAV Receiver. The first conversion, from rf to 18-MHz if., is accomplished by mixing the rf input with a vhf injection signal (18 MHz above the rf input) from the 680T-1 VHF Synthesizer Planar Assembly. The second conversion from 18 MHz if. to 498.5 kHz if. is accomplished by mixing the first if. signal with an 18.4985-MHz local oscillator signal.

(2) VHF Tuner and IF. Circuits.

(a) Tune Voltage Switch. (Refer to figure 7.)

The purpose of the tune voltage switch is to disable the vhf tuner when the 313N-( ) control is tuned to a frequency other than a NAV (VOR or LOC) frequency or when a self-test function is being performed. While the receiver is operating on a NAV frequency, Q3 is inhibited and the tune voltage from the 680T-1 VHF Synthesizer is applied to the voltage variable tuning capacitors in the vhf tuner. If the 313N-( ) control is tuned to a frequency other than a NAV frequency a voltage is applied from inverter Z1Q2 to the biasing network CR7, R10, and R16. This biases Q3 into saturation and the tuning voltage from the synthesizer will be grounded through Q3. The same events occur when the self-test circuits are actuated, except the bias voltage to Q3 is supplied by test enable Z2Q9 to biasing network CR4, R7, and R16.



Tune Voltage Switch, Simplified Schematic Diagram
Figure 7

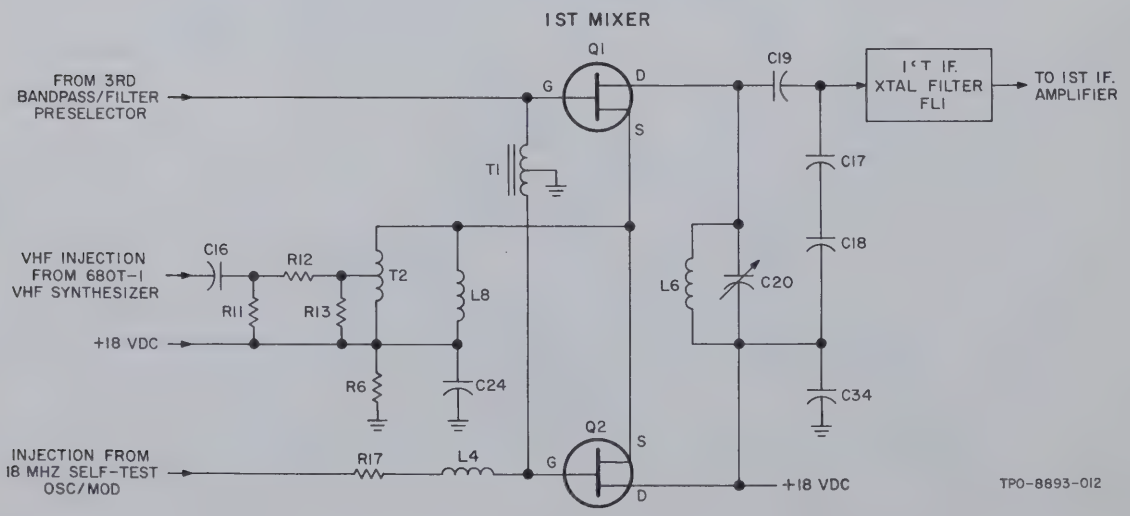
(b) VHF Tuner and First Mixer Z8.

1. VHF Tuner. (Refer to figure 804, sheet 2.)

The modulated rf signal received by the antenna is applied to the vhf tuner through a coaxial lead to inductor L1. The 680T-1 VHF Synthesizer supplies a dc tuning voltage that tunes three minimum-loss bandpass filter/preselectors (figure 802, sheet 2). Each filter consists of two voltage-variable capacitors, an inductor, and a trimmer capacitor. Varying the tuning voltage from +8 to +15 volts varies the capacitance of the voltage-variable capacitors. This allows the filters to be tuned in 50-kHz steps from 180.00 to 117.95 MHz, except for the odd-tenth frequencies from 108.1 to 111.9 for VOR, and in 200-kHz steps from 108.1 to 111.9 MHz for localizer, when using a control unit with the proper frequency spacing.

2. First Mixer. (Refer to figure 8.)

The rf input from the filters is applied to a pair of balanced field effect transistors (fet) Q1 and Q2. Transistors Q1 and Q2 comprise the first mixer. Center-tapped transformer T1 applies 180-degree out-of-phase rf input to the gates of Q1 and Q2. The 680T-1 VHF Synthesizer injection is applied through coupling capacitor C16 to the source terminals of the mixer. Inductor L8 and resistors R11 and R6 form the bias network for the mixer circuit. Through the heterodyne action of the first mixer (Q1 and Q2), a difference frequency of 18 MHz is obtained. Tank circuit L6 and C20 is tuned for resonance at 18 MHz to provide rejection for all other frequencies resulting from the action of the first mixer. Capacitors C19, C17, and the tank circuit provide the load for the first mixer and match its output impedance to the input impedance of the 18-MHz filter FL1. Filter FL1 is a crystal filter tuned to 18 MHz. The narrow passband of the filter ensures good receiver selectivity and greatly attenuates spurious response.



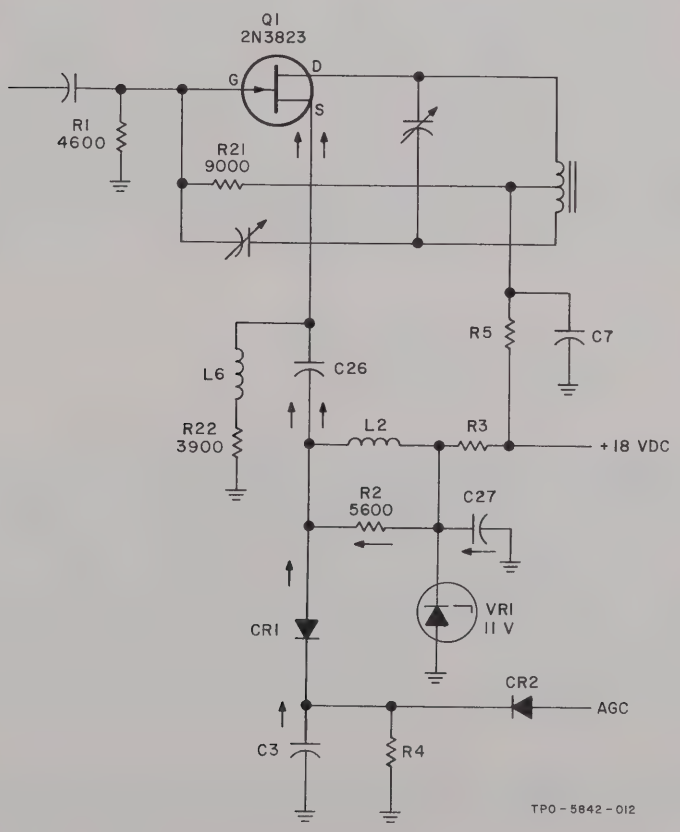
First Mixer, Simplified Schematic Diagram
Figure 8

(c) First 18-MHz IF. Z7. (Refer to figure 9.)

A parallel tank circuit in the 18-MHz if. is formed by C1 and L1, and is resonant at 18 MHz. This circuit also provides the load and impedance match for the output of the 18-MHz crystal filter.

Field effect transistor (fet) Q1 is used for the first if. amplifier because of a fet's dynamic range, narrow bandwidth, and low noise characteristics. Bias on the gate of Q1 is established at approximately +5 volts by voltage divider R1 and R21. About 2 ma of source current establishes the negative source-to-gate potential required for operation of the n-type fet.

Agc control of the first if. stage is maintained with Q1 operating with fixed and self dc bias. Breakdown diode VR1 controls the bias voltage for CR1. With agc below 11 volts, CR1 is forward biased, providing an ac path from ground through C3, CR1, and C26 to the source of Q1. With this path there is no degenerative feedback to reduce the gain of Q1. As the agc voltage rises to a level sufficient to forward bias CR2 and reverse bias CR1, an ac path is provided for the source of Q1 through C27, R2, and C26. The greater impedance of this path causes degenerative feedback from the drain to the gate that results in a reduction of the gain of the first if. amplifier. The 18-MHz output of Q1 is transformer coupled to the second if. amplifier Q2.



First IF. Amplifier, Simplified Schematic Diagram
Figure 9

(d) Second IF. Amplifier and Mixer, Part of Z7. (Refer to figure 804, sheet 2.)

The second if. amplifier Q2 provides a voltage gain controlled by forward agc. As the 18-MHz input signal increases, the agc voltage increases, driving Q2 toward saturation. This decreases the output of the stage. The amplified output from Q2 is applied to the base of second mixer Q4.

The second mixer Q4 receives an 18.4985-MHz injection signal from the 18.4985-MHz crystal oscillator Q3. The injection level for the second mixer is held to approximately 100 mv to reduce radiation of the 18.4985-MHz oscillator. The output of the 18.4985-MHz oscillator Q3 is capacitor coupled to the emitter of second mixer Q4 to ensure a clean input signal to the second mixer. Shielding of the 18.4985-MHz oscillator reduces spurious radiation to the other parts of the receiver.

The heterodyning action in the second mixer provides a difference frequency of 498.5 kHz. The output impedance of Q4 is matched to the input of the second if. crystal, FL2. Filter FL2 has a 50-kHz, 3-db bandpass, with a 30-db or greater rejection of out-of-band signals.

(e) 948.5-kHz IF. Z3. (Refer to figure 804, sheet 3.)

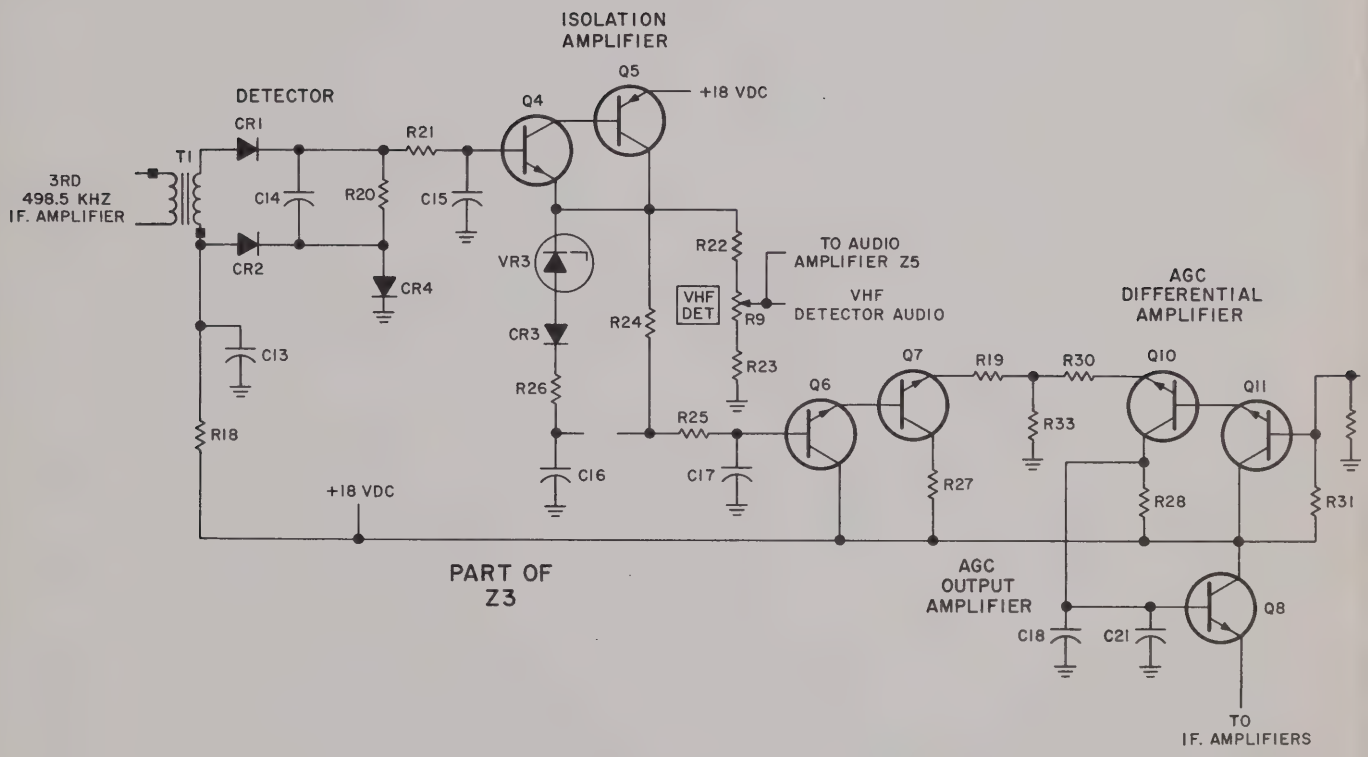
The 498.5-kHz difference frequency from the second mixer is amplified by the first, second, and third 498.5-kHz if. amplifiers Q1, Q2, and Q3. The first and second if. amplifiers are agc controlled by forward agc. As the input signals increase, the agc voltage becomes more positive, driving the amplifiers toward saturation and reducing the gain of each stage. No agc delay is provided; therefore, the gain of the two stages is reduced as soon as an increase in signal input is sensed by the agc amplifier. The output of the third 498.5-kHz if. amplifier Q3 is applied through a 2:1 step-up transformer, T1, to the detector.

(3) Detector and AGC Circuits, Part of Z3.

(a) Detector. (Refer to figure 10.)

Transformer T1 couples the modulated 498.5-kHz if. signal to detector CR1. Detector CR1 is biased on at all times. Noise, present when no rf is applied to the diode, is sufficient to forward bias CR1. Diode CR2, in parallel with CR1, compensates for temperature variations that affect detector CR1. The detected signal is developed across R20, causing C14 to charge and discharge. Capacitor C14 charges and discharges according to modulation peaks and valleys, but essentially shorts the 498.5-kHz carrier component to ground through CR4. The detected rf (audio) is applied through R21 and filter capacitor C15 to the base of isolation amplifier Q4, Q5.

Isolation amplifiers Q4 and Q5 are an assisted follower pair with maximum degenerative feedback to stabilize the output level. Zener diode VR3, diode CR2, and resistor R26 comprise a speedup network. When a



Dectector/AGC Circuits, Simplified Schematic Diagram
Figure 10

(d) Second IF. Amplifier and Mixer, Part of Z7. (Refer to figure 804, sheet 2.)

The second if. amplifier Q2 provides a voltage gain controlled by forward agc. As the 18-MHz input signal increases, the agc voltage increases, driving Q2 toward saturation. This decreases the output of the stage. The amplified output from Q2 is applied to the base of second mixer Q4.

The second mixer Q4 receives an 18.4985-MHz injection signal from the 18.4985-MHz crystal oscillator Q3. The injection level for the second mixer is held to approximately 100 mv to reduce radiation of the 18.4985-MHz oscillator. The output of the 18.4985-MHz oscillator Q3 is capacitor coupled to the emitter of second mixer Q4 to ensure a clean input signal to the second mixer. Shielding of the 18.4985-MHz oscillator reduces spurious radiation to the other parts of the receiver.

The heterodyning action in the second mixer provides a difference frequency of 498.5 kHz. The output impedance of Q4 is matched to the input of the second if. crystal, FL2. Filter FL2 has a 50-kHz, 3-db bandpass, with a 30-db or greater rejection of out-of-band signals.

(e) 948.5-kHz IF. Z3. (Refer to figure 804, sheet 3.)

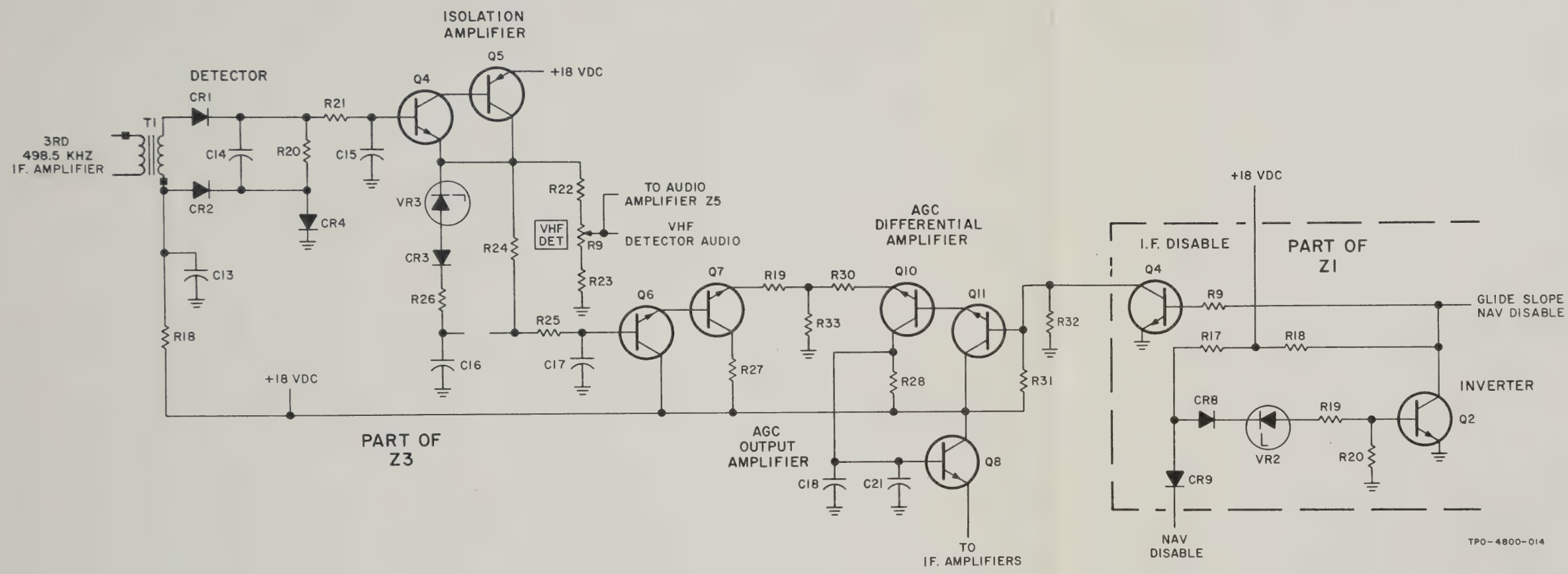
The 498.5-kHz difference frequency from the second mixer is amplified by the first, second, and third 498.5-kHz if. amplifiers Q1, Q2, and Q3. The first and second if. amplifiers are agc controlled by forward agc. As the input signals increase, the agc voltage becomes more positive, driving the amplifiers toward saturation and reducing the gain of each stage. No agc delay is provided; therefore, the gain of the two stages is reduced as soon as an increase in signal input is sensed by the agc amplifier. The output of the third 498.5-kHz if. amplifier Q3 is applied through a 2:1 step-up transformer, T1, to the detector.

(3) Detector and AGC Circuits, Part of Z3.

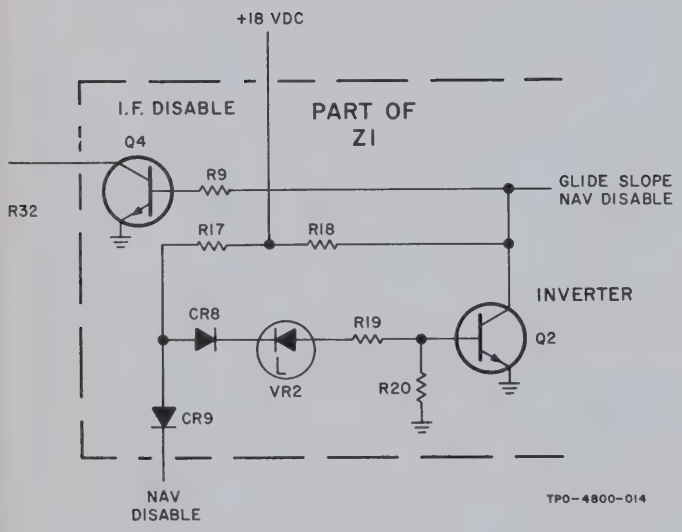
(a) Detector. (Refer to figure 10.)

Transformer T1 couples the modulated 498.5-kHz if. signal to detector CR1. Detector CR1 is biased on at all times. Noise, present when no rf is applied to the diode, is sufficient to forward bias CR1. Diode CR2, in parallel with CR1, compensates for temperature variations that affect detector CR1. The detected signal is developed across R20, causing C14 to charge and discharge. Capacitor C14 charges and discharges according to modulation peaks and valleys, but essentially shorts the 498.5-kHz carrier component to ground through CR4. The detected rf (audio) is applied through R21 and filter capacitor C15 to the base of isolation amplifier Q4, Q5.

Isolation amplifiers Q4 and Q5 are an assisted follower pair with maximum degenerative feedback to stabilize the output level. Zener diode VR3, diode CR2, and resistor R26 comprise a speedup network. When a



Dectector/AGC Circuits, Simplified Schematic Diagram
Figure 10


+18 VDC
I.F. DISABLE
PART OF
Z1
Q4
R9
GLIDE SLOPE
NAV DISABLE
R32
R17
R18
INVERTER
CR8
R19
Q2
VR2
R20
CR9
NAV
DISABLE
TP0-4800-014

large signal is applied to the receiver, Q4 and Q5 will produce an output voltage which will exceed the breakdown voltage of VR3 (+7.5 volts dc). The output signal will then pass through VR3, CR3, and R26, bypassing the larger impedance of R24 and initiating agc action. The audio output is developed across resistive divider R22, R9, R23. The audio is taken from the arm of potentiometer R9 and applied to the 844A-1 VOR/LOC Instrumentation Planar Assembly and to the audio amplifier Z5. Potentiometer R9 provides for adjustment of the vhf detector audio level.

(b) AGC Circuit. (Refer to figure 10.)

Agc control of the detector audio output is provided by agc differential amplifier Q6, Q7, Q10, Q11 through agc output amplifier Q8. The agc output voltage from Q8, determined by the level of the detected rf (and consequently by the level of the rf input to the vhf receiver) is applied to the 18-MHz if. amplifiers and to the first two 498.5-kHz if. amplifiers. Control of each if. amplifier stage gain keeps the output of the third 498.5-kHz if. amplifier constant, regardless of the rf input level.

The output of the isolation amplifier stage Q4, Q5 provides the source for the agc amplifiers. The isolation amplifier isolates the low input impedance of the agc differential amplifier from the detector output, thus preventing loading of the detector.

The reference level input for the agc differential amplifier is provided by voltage divider R31, R32. Resistor R32 develops approximately +4.3 volts dc at the base of Q11. This voltage holds Q11 on at all times and provides a constant dc bias for the base of Q10. Conduction of Q10, therefore, is determined by the voltage developed across R33 and applied to the emitter of Q10.

The other input to the agc differential amplifier, at the base of Q6, is not a constant voltage. Instead, this voltage varies with the detected rf (audio) level fed back to the emitter of Q4. Resistors R24 and R25, and capacitors C16 and C17 filter the signal to provide dc voltage at the base of Q6. The level of the dc voltage is approximately equal to the level of the audio output from CR1.

The varying dc level at the base of Q6 varies the conduction of Q6. When the rf input to the vhf receiver is near zero, the level of the detected rf signal decreases. The corresponding decrease in the dc level at the base of Q6 causes Q6 to decrease conduction.

The base-to-emitter resistance of Q6 increases, thereby decreasing the voltage at the base of Q7. Transistor Q7 also decreases conduction and the emitter voltage of Q7 drops. The voltage developed across R33 decreases, thus increasing the forward negative-to-positive emitter-base bias on Q10. The collector voltage of Q10 decreases, this decrease being applied to the base of agc output amplifier Q8. Conduction of Q8 decreases and the resulting agc output voltage, applied through the collector-emitter junction of Q8, decreases.

The agc voltage applied to the 18.5-MHz and 498.5-kHz if. stages is minimum for zero (or low) rf input. This enables the if. amplifiers to provide maximum gain to the if. signal, keeping the output of the third 498.5-kHz if. amplifier constant; as a result, the level of the detected rf (audio) output is held constant (neglecting the time required for agc to regulate the stage gain of each if. amplifier).

Assume that the rf input level increases. The detected rf level increases and the base voltage of Q6 increases. Transistor Q6 approaches saturation and causes the base voltage of Q7 to increase. This forward biases Q7, causing Q7 to approach saturation. As a result, the voltage across R33 increases. The increasing voltage developed across R33 is applied to the n-type emitter of Q10, and reverse biases the emitter-base junction of Q10, causing Q10 to approach cutoff. As Q10 approaches cutoff, the collector voltage increases. The increase in collector voltage of Q10 is applied as forward bias to the base of agc output amplifier Q8. Transistor Q8 approaches saturation, resulting in an increase of agc voltage at the output (emitter) of Q8.

The agc voltage applied to the 18-MHz and 498.5-kHz if. stages is maximum when the rf input is maximum. The gain of the affected if. stages is decreased, keeping the output of the third 498.5-kHz if. amplifier constant; as a result, the level of the detected rf (audio) output is held constant.

A NAV disable function is provided to disable the if. circuit whenever a frequency is selected on the 313N-( ) remote control unit that is out of the VOR/LOC frequency range of 108.00 to 117.95 MHz.

With a frequency selected that is in the VOR/LOC frequency range, inverter Q2 (figure 10) is saturated. Forward bias for Q2 is applied from the +18-volt dc line to the junction of CR8 and CR9. Because a VOR/LOC frequency is selected, a NAV disable input is not applied to the cathode of CR9, and diode CR9 does not conduct. The +18 volts dc is applied through CR8 and zener diode VR2. The anode of VR2 is maintained at +5.1 volts dc, which is applied to the base of inverter Q2, causing Q2 to saturate. As Q2 saturates, the collector voltage decreases. This decreasing voltage is applied to the base of if. disable Q4, causing Q4 to inhibit. With Q4 inhibited, the agc circuit and the if. circuits function normally as discussed in the previous paragraphs.

Assume that a frequency is selected that is out of the VOR/LOC frequency range. When this occurs, a shorting switch in the remote control unit closes, placing a ground on the cathode of CR9. Diode CR9 becomes forward biased. The positive voltage at the junction of CR8 and CR9 decreases until it is below the +5.1-volt zener voltage of VR2. Zener diode VR2 cuts off, removing the forward bias voltage from the base of inverter Q2. Inverter Q2 inhibits, and the collector voltage begins to increase. The increasing voltage is applied to the base of if. disable Q4, providing forward bias for Q4. If. disable Q4 saturates, and provides a ground path through the collector-emitter of Q4 for the agc reference voltage developed at the junction of R31 and R32. With the reference voltage grounded, Q11 inhibits

and removes the base voltage from Q10. This causes Q10 to inhibit, and the +18-volt level at the collector of Q10 is coupled to the base of agc output amplifier Q8. Transistor Q8 saturates and the agc output is the +18-volt level on the collector of Q8. This maximum agc disables the if. stages by diminishing the gain of each stage.

(4) Audio Amplifier Z5. (Refer to figure 804, sheet 3.)

Detected rf (audio) from the detector is applied to emitter follower Q1 through coupling network C1 and R2. Transistor Q1 amplifies the audio and applies it to audio bandpass filter FL1. The audio is taken from the arm of AUD LVL control R6 and applied to the base of Q2.

The audio is then amplified by audio amplifiers Q2 and Q3 and coupled to phase splitter Q4. The outputs of the phase splitter are taken from both the collector and the emitter to provide two signals that are 180 degrees out-of-phase. The PA driver and output amplifier, Q5-Q8, consist of two pairs of class B push-pull amplifiers. Since class B operation provides amplification only when the signal is positive, push-pull amplifiers are used to provide amplification over the complete cycle of the waveform. One push-pull amplifier is operative when the signal is positive and the other is operative on the negative half-cycle of the waveform. Center-tapped transformer T1 reconstructs the amplifier waveform at the output.

(5) Audio Test Generator and Timer Z2.

(a) General.

The audio test generator and timer circuits provide self-test timing sequence control voltages and predetermined audio frequency outputs. The audio frequency outputs consist of combined 90- and 150-Hz signals to provide the glideslope and localizer up-left and down-right modulation voltages, 30- and 9960-Hz signals that are combined to provide the VOR bearing test signal, and a 900-Hz audio signal that is mixed with the VOR bearing test signal to provide the complete VOR bearing audio and aural test modulation signals. These audio outputs modulate the test oscillators in the 1051B-1 VHF NAV Receiver and the 951A-1 Glideslope Receiver to provide VOR and ILS up-left or ILS down-right self-tests of the 51RV-2B VOR/ILS Receiver. The desired test is initiated by actuating the NAV test switch on the 313N-( ) control to the appropriate position, or by actuating a remote self-test switch, or by actuating the appropriate pushbutton switch on the 51RV-2B front panel. The pushbutton switches on the 51RV-2B front panel are designated VOR, UP/L, and DN/R according to the test that each will operate. Actuating any one of the switches will operate the audio test generator and timer circuits provided the 51RV-2B is tuned to a VOR frequency when the VOR switch is actuated, or to a localizer frequency when the UP/L and DN/R switch is actuated.

The audio test generator and timer consists of two major circuits: the timer circuit and the audio test generator circuit. In order to analyze the audio test generator and timer, it will first be necessary to understand the overall

operation of the audio test generator and timer. Paragraph (b) discusses the overall operation of the audio test generator and timer. After the overall operation discussion, the timer circuit theory is presented in paragraph (c) followed by the theory of the audio test generator circuit in paragraph (d).

(b) Audio Test Generator and Timer, Overall Operation.

During operation, the timer circuits provide the control for the audio test generator. The timer circuit operation remains the same regardless of whether a VOR or an ILS self-test is being performed. The audio test generator circuits generate the actual test signals, and the operation of this circuit differs depending on whether a VOR or an ILS self-test is being performed.

In order to operate the audio test generator and timer, the 51RV-2B must be tuned to the appropriate frequency (VOR or localizer), and the corresponding self-test switch (either on the 51RV-2B front panel or remotely located) must be actuated. As soon as the proper self-test switch is actuated, the timer operating sequence begins. The first event is the enabling of a 3-second timer. With this timer enabled, the corresponding VOR, LOC, or GS (depending on which self-test is being performed) indicator flag(s) will come into view, and remain in view throughout the 3-second timer operational period. An exception to this is the time the VOR flag could remain in view as a result of the slew time of the RMI pointer rotating to 180 degrees. Assume that a VOR self-test is initiated with the OBS positioned to 0 degree, and the RMI pointer at 0 degree. In this case, the RMI pointer would have to travel a full 180 degrees to satisfy the self-test signal. Therefore, the slew time of the RMI would add to the time of the 3-second timer, and could, depending on the particular RMI, be as great as 9 seconds. The VOR flag would therefore remain in view for the total time period, or 9 seconds. With the OBS at 0 degree during VOR self-test, the to/from indicator shows "from." A "to" indication is provided if the OBS is positioned to 180 degrees and a VOR self-test is initiated.

As soon as the 3-second timer cycle has ended, the 20-second timer is enabled (regardless of whether the RMI pointer has reached 180 degrees during a VOR test). With the 20-second timer enabled, the indicator flag(s) retract, and a switch in the timer circuit applies operating voltages to the audio test generator circuits. However, during a VOR test the flag will remain in view until the RMI pointer reaches 180 degrees even though the 20-second timer is operating. The outputs from the audio test generator circuits are applied to the test oscillator and modulators in the 1051B-1 VHF NAV Receiver (for VOR self-test and the localizer portion of UP/L and DN/R ILS self-tests) and in the 951A-1 Glideslope Receiver (for the UP/L and DN/R portion of the ILS self-test). If the 51RV-2B circuits being tested are functioning normally, the VOR/ILS deviation indicators provide the proper centering, up-left, or down-right indications and the flag(s) remain out of view. If a malfunction occurs or is present in the 51RV-2B circuits under test, the respective VOR, LOC, or GS flag(s) remain in view. If any of the self-test switches remain actuated until the 20-second timer

cycle ends, the VOR, LOC, and GS flags come into view. The self-test switch must be released and actuated again if it is desired to recycle the audio test generator and timer. If a self-test switch is actuated again, the 3- and 20-second timer operation sequence is repeated. The coming into view of the VOR, LOC, and GS flags after the 20-second timer cycle ends is part of the fail-safe capability of the 51RV-2B. If a malfunction occurs in the audio test generator and timer during an in-flight test, the flags would come into view and remain in view after the 20-second timer cycle ended. This would provide the pilot with flag warnings showing that the deviation indications on the flight instruments are unreliable and a malfunction has occurred in the 51RV-2B.

(c) Timer Circuits. (Refer to figure 11.)

1. General.

Only the VOR test switch, S1, is shown in figure 11 in order to simplify the discussion. The solid line on S1 indicates the normal position of the switch (no test in process). The dotted line on S1 depicts the positioning of the switch after a VOR self-test is initiated. The +18-vdc (VOR) voltage is switched by the VOR/LOC mode relay K1 located on the 1051B-1 VHF NAV Receiver sideboard. Plus 18 vdc (VOR) is applied to the junction of CR15 and CR18 only when the 51RV-2B (and 313N-( ) control) is tuned to a VOR frequency.

The timer circuit establishes four separate time intervals as shown below the waveforms in figure 11. Interval number 1 is the time that no self-test is being conducted, and corresponds to the open position (solid line) of VOR test switch S1. Interval number 2 is the first 3 seconds after a self-test is initiated, and corresponds to the closed position (dotted line) of VOR test switch S1. Interval number 3 is the time allotted for operation of the 20-second timer and the audio test generator circuits. Interval number 4 begins after the 20-second timer cycle has ended, and continues for any period of time until the operator releases the self-test switch. When the self-test switch is released, the timer circuit is again at the interval number 1 position. Analyses of the timer circuits is presented below using the time intervals just described.

2. Theory.

The timer circuits consist of transistors Q9 through Q15 and their associated components. Two timing circuits are provided: a 3-second timer (Q11 and Q12) and a 20-second timer (Q14). Two outputs are provided by the timer circuits, with both outputs controlled by the 3- and 20-second timers. Both of the outputs sequentially vary between either 0 or +18 vdc, and each output performs a separate function. One of the outputs is the flag enable output that controls the flag circuits in the 844A-1 VOR/LOC instrumentation and 951A-1 Glideslope Receiver during self-test. The other output is the test enable output that controls the enabling of the audio test generator portion of the audio test generator and timer, and the enabling of the test oscillator/modulators in the

1051B-1 VHF NAV Receiver and 951A-1 Glideslope Receiver. Transistor Q13 provides the flag enable output, and the combination of Q9 and Q10 provides the test enable output. The timer circuit and the two outputs from the timer circuit are, in turn, controlled by the front panel mounted or remotely located self-test switches.

a. Interval Number 1.

The following transistor states exist during interval number 1:

(1) Test request initiate Q15 is saturated.

(2) 3-second timer Q11 is inhibited.

(3) 3-second timer hold Q12 is inhibited.

(4) Test enable control Q10 is inhibited.

(5) Test enable Q9 is inhibited.

(6) 20-second timer Q14 is saturated.

(7) Flag enable Q13 is saturated.

As previously mentioned, interval number 1 is the time that S1 is open and no self-test is being conducted. During this interval, waveform G shows that Q13 is saturated and the flag enable output is +18 vdc. This means that the flag circuits in the 844A-1 VOR/LOC Instrumentation and 951A-1 Glideslope Receiver are operating normally (no self-test is being conducted). Interval 1 of waveform C shows that Q9 is inhibited, resulting in 0 volt at the test enable output. No audio test signals are being generated, and the 1051B-1 VHF NAV Receiver and 951A-1 Glideslope Receiver test oscillator/modulators are inhibited. Diode CR8 is reverse biased by the +18-vdc (VOR) voltage, and CR9 is forward biased by the +18-vdc flag enable output from the collector of Q13. The +18-vdc (VOR) voltage forward biases CR15, placing approximately +15 vdc on the bottom of C10 (effectively no charge on C10). The voltage at the bottom of C10 and at the cathodes of CR8 and CR9 is approximately +15 vdc due to the voltage drop across R58, CR15, and R45, and is shown by interval 1 in waveform B. Plus 18-vdc (VOR) voltage saturates Q15, which forward biases CR12 and CR13. With CR12 forward biased, the base of Q13 is grounded, causing Q13 to saturate. The output from Q13, taken from the collector, is the +18-vdc flag enable output (waveform G). The forward bias on CR13 during interval number 1 keeps the test enable output at 0 volt (waveform C). Transistor Q14 is saturated during interval number 1 and reverse biases CR10. Resistor R51 and capacitor C11 form the 20-second RC timing network. Waveform E shows that during interval number 1, one side of C11 is at +16 vdc and the other side of C11 (waveform D) is at 0 volt because CR13 is forward biased (C11 is charged to +16 vdc).

b. Interval Number 2.

Interval number 2 is initiated by actuating the VOR test switch S1 (as shown by the dotted line). As soon as S1 is actuated, the following transistor states exist:

(1) Test request initiate Q15 inhibits.

(2) Flag enable Q13 inhibits.

The +18-vdc (VOR) voltage is applied to ground through forward biased CR18 when S1 is actuated. The base of Q15 is also placed at ground through CR18, causing Q15 to inhibit. This reverse biases CR12 and CR13, causing the collector of Q15 to go positive as shown in interval 2 of waveform A. With CR12 reverse biased, +18 vdc is applied to the base of Q13 (waveform F) and inhibits Q13. The flag enable output now drops to 0 volt, causing the 951A-1 Glideslope Receiver and/or 844A-1 VOR/LOC Instrumentation flag circuits to provide a warning condition. The VOR, or LOC and GS flags on the cockpit indicators will simultaneously come into view (depending on whether a VOR, UP/L, or DN/R self-test is being conducted). With VOR test switch S1 actuated, CR10 remains reverse biased as during interval 1. Thus the +18 vdc at the base of Q13 is also the source of collector voltage for Q15 during interval 2. The relationship can be seen by comparing interval 2 of waveform A with interval 2 of waveform F. The test enable output remains a 0 volt throughout interval 2 as shown by waveform C. The +18 vdc on the collector of Q15 reverse biases CR13, thereby preventing +18 vdc from reaching the test enable output. Transistor Q9 remains inhibited throughout interval 2. The 20-second timer RC network (R51 and C11) remains the same as discussed for interval number 1 (C11 is charged to +16 vdc).

The most prominent event that occurs during interval 2 is the enabling of the 3-second timer. Resistor R45 and capacitor C10 form the 3-second RC timing network. When S1 is actuated, CR15 also becomes reverse biased. During interval 1, CR15 was forward biased, C10 was effectively discharged, and +15 vdc (waveform B) appeared entirely across R45. The instant that CR15 becomes reverse biased, the bottom end of C10 is removed from the +18 vdc (VOR) source. Capacitor C10 now begins to charge across R45 to a voltage level of approximately +9 vdc as determined by VR3, R42, CR8, and the value of R45. The voltage across C10 increases while C10 is charging. However, while C10 is charging, the voltage across R45 during interval 2 decreases as shown by waveform B. At the end of interval 2 (3 seconds after actuating the self-test switch), the voltage on the base of Q11 drops below the emitter voltage of Q11, causing Q11 to saturate. If for some reason the flag enable output does not go to 0 volt at the start of interval 2 as shown by waveform G (Q13 does not inhibit), R46, C12, and CR9 provide an interlock

loop that prevents C10 from charging. Therefore, if at the start of interval 2 (waveform G) the flag enable voltage does not go to 0 volt, 3-second timer Q11 will not saturate because the 3-second RC timing network (R45 and C10) remains inhibited.

At the end of interval number 2, the following transistor states exist:

(1) 3-second timer Q11 is saturated.

(2) 3-second timer hold Q12 is saturated.

(3) Test enable control Q10 is saturated.

(4) Test enable Q9 is saturated.

(5) 20-second timer Q14 is inhibited.

(6) Flag enable Q13 is saturated.

c. Interval Number 3.

The above mentioned transistor states mark the beginning of interval number 3. The prominent events occurring during interval 3 are the enabling of the test enable output and the flag enable output.

At the end of interval 2 when Q11 saturates, the collector voltage increases. This positive voltage is applied to the bases of Q12 and Q10, causing both transistors to saturate. The transistor states existing at the end of interval 2 show that both Q12 and Q13 are saturated. Flag enable Q13 saturates and the collector voltage goes to +18 vdc as shown by waveform G. This +18 vdc is applied to the 951A-1 Glideslope Receiver and/or 844A-1 VOR/LOC Instrumentation flag circuits, and causes the VOR or LOC and GS flags on the cockpit indicators to be removed from view. An exception to this is that during VOR test, the slew time of the RMI pointer may cause the flag circuit in the 844A-1 VOR/LOC Instrumentation to keep the VOR flag in view until the RMI pointer has had time to rotate to the 180-degree position, at which time the VOR flag will be removed from view. As shown in figure 11, the flag enable output line is also connected to the base of Q11 through R46, CR9, and CR8. When the flag enable voltage goes to +18 vdc at the beginning of interval 3 (waveform G), this same voltage would forward bias CR9 and cause the 3-second timer Q11 to inhibit. If this were to occur, the self-test would be terminated at this time, and no self-test information would be presented on the cockpit indicators. The 3-second timer hold Q12 prevents this from occurring. A slight time delay occurs at the end of interval 2 between the saturation of Q12 and of Q13. Because the base of Q12 is connected through R43 to the collector of Q11, Q12 saturates before Q13 saturates. With Q12 saturated, the anode of CR9 is grounded through the emitter-collector junction of

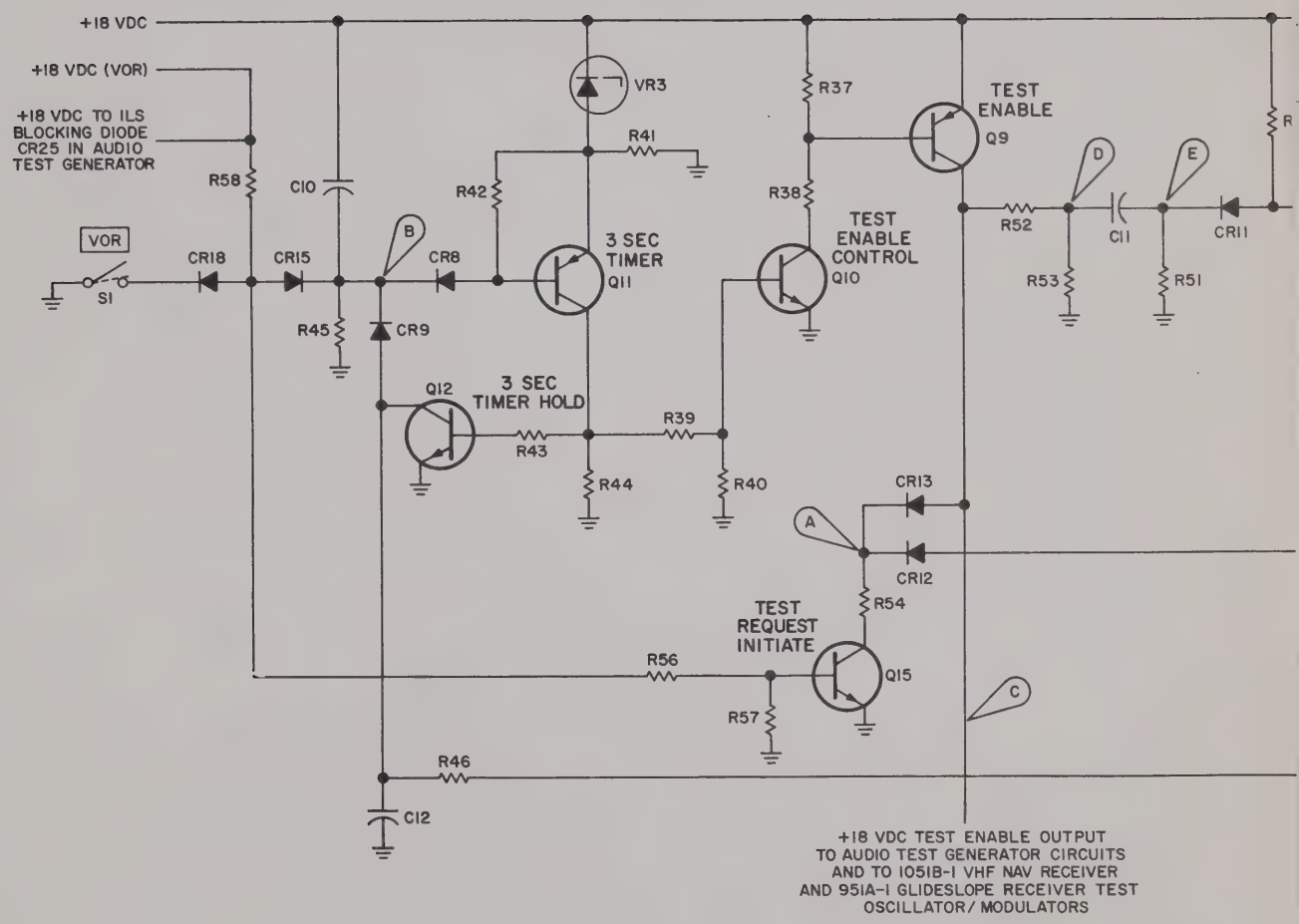
Q12, thereby reverse biasing CR9. Shortly after Q12 saturates, Q13 also saturates. However, because Q12 is already saturated, the +18 vdc applied through R46 cannot forward bias CR9, but is instead applied through Q12 to ground. Thus 3-second timer Q11 remains saturated throughout interval 3 as shown by waveform B. The time delay that occurs between the saturation of Q12 and Q13 is brought about entirely by the three additional stages that the collector signal of Q11 must go through before Q13 can saturate. These stages are discussed in the following paragraphs.

At the beginning of interval 3 the collector of Q11 goes positive and saturates Q12. This same positive collector signal is applied to test enable control Q10, and causes Q10 to saturate. The collector of Q10 is grounded and the voltage at the junction of R37 and R38 becomes less positive. This voltage is applied to the base of test enable Q9, and because the base is now negative with respect to the emitter, Q9 saturates. Waveform C shows that when interval 3 begins, the test enable output becomes +18 vdc (Q9 saturated). The test oscillator/modulators in the 951A-1 Glideslope Receiver and/or 1051B-1 VHF NAV Receiver are enabled and the audio test generator portion of the audio test generator and timer becomes enabled. Self-test outputs from the audio test generator are now applied through the 51RV-2B to provide the cockpit indicators with displays of the selected self-test information. As soon as Q9 saturates (beginning of interval 3), the 20-second timer becomes enabled. During interval 2, the voltage at the junction of R52 and R53 was 0 volt as shown by waveform D, and the voltage across R51 (through R50 and forward biased CR11) was +16 vdc as shown by waveform E. Therefore, during interval 2, C11 was charged to +16 vdc. Waveform D shows that when interval 3 begins, the voltage at the junction of R52 and R53 rises to approximately +16 vdc. This +16 vdc (waveform D) adds to the existing +16 vdc on C11 and raises the voltage across R51 to approximately +32 vdc as shown by waveform E. This reverse biases CR11 and allows the voltage at the base of Q14 to become positive enough to inhibit Q14. It is when Q14 inhibits that CR10 becomes forward biased and allows flag enable Q13 to saturate (as mentioned at the beginning of the interval number 3 discussion). Waveform E depicts the discharging of C11 through R51 during interval 3. When C11 has discharged through R51 for approximately 20 seconds, the voltage across R51 becomes low enough to allow CR11 to again become forward biased. At this time (the end of interval 3), Q14 saturates and reverse biases CR10. Flag enable Q13, which was saturated throughout interval 3, now inhibits due to the reverse biasing of CR10, which restores the positive base voltage as shown by waveform F (at the end of interval 3). Waveform G shows that the flag enable output goes to 0 volt at this time. When this occurs, the flag circuits in the 951A-1 Glideslope Receiver and/or 844A-1 VOR/LOC Instrumentation inhibit and allow the VOR or LOC and GS cockpit indicator flags to come into view. However, waveform C shows that at the end of interval 3, +18 vdc is still

applied as the test enable output. Therefore, the audio test generator and the oscillator/modulators in the respective receivers remain enabled, and provide self-test deviation outputs to the cockpit indicators. Because the flags are now showing (waveform G at the end of interval 3), the pilot interprets the deviation information due to the self-test as erroneous and unusable for navigational purposes. Interval number 4 now begins.

d. Interval Number 4.

Interval number 4 is the time allotted after the 20-second timer cycle has ended. The timer circuit conditions for interval number 4 will remain as shown by the waveforms in figure 11 for as long as the self-test switch is actuated. Although a test enable output is still being provided (waveform C), waveform G shows that the flag enable output has gone to 0 volt (cockpit indicator flag(s) are now in view). Interval number 4 continues until the self-test switch is released. When the self-test switch is released, the timer circuit returns to the conditions described in the interval number 1 discussion and remains in the interval number 1 condition until the self-test switch is actuated again. When the self-test switch is actuated again, the timer cycle (intervals 2, 3, and 4 of figure 11) is repeated.

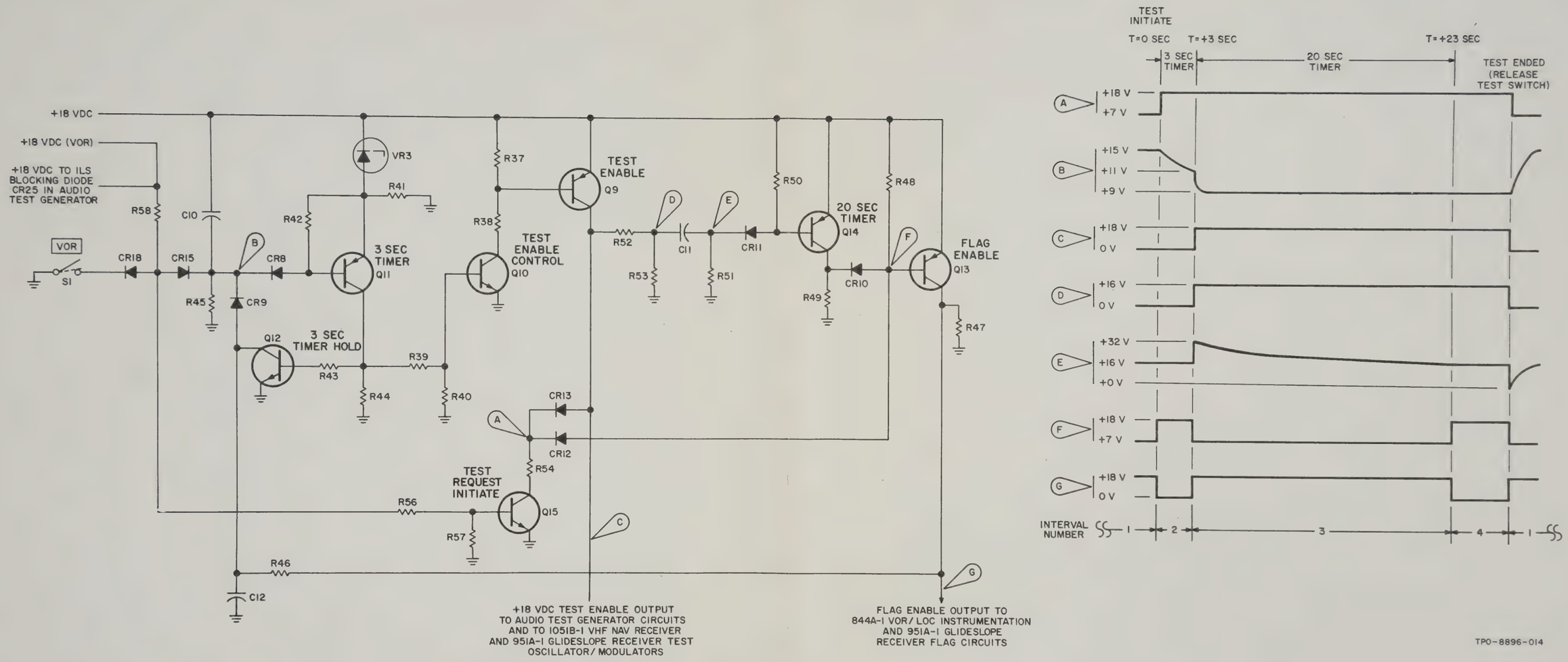


Timer Circuit, Simplified Schematic Diagram
Figure 11

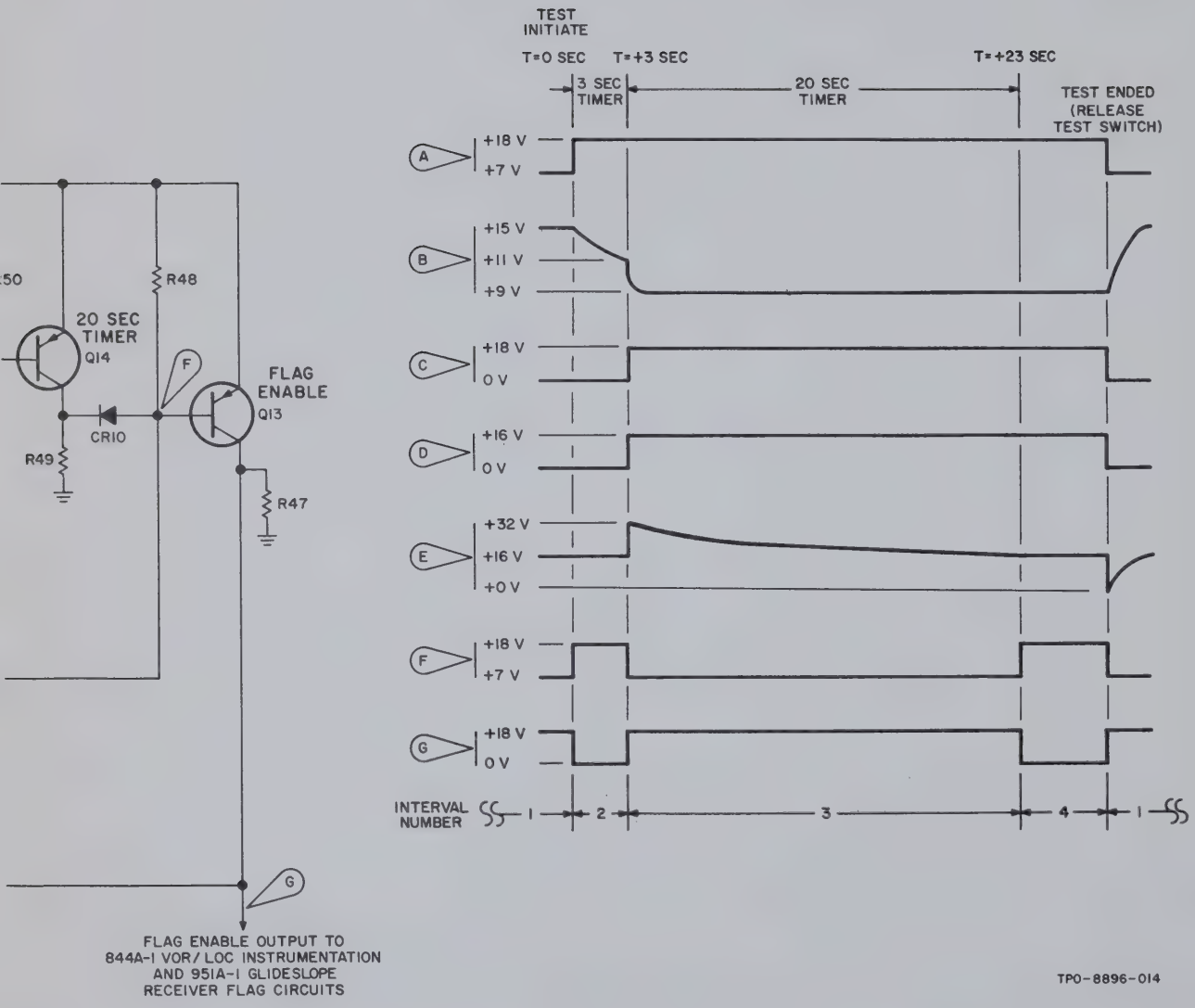
applied as the test enable output. Therefore, the audio test generator and the oscillator/modulators in the respective receivers remain enabled, and provide self-test deviation outputs to the cockpit indicators. Because the flags are now showing (waveform G at the end of interval 3), the pilot interprets the deviation information due to the self-test as erroneous and unusable for navigational purposes. Interval number 4 now begins.

d. Interval Number 4.

Interval number 4 is the time allotted after the 20-second timer cycle has ended. The timer circuit conditions for interval number 4 will remain as shown by the waveforms in figure 11 for as long as the self-test switch is actuated. Although a test enable output is still being provided (waveform C), waveform G shows that the flag enable output has gone to 0 volt (cockpit indicator flag(s) are now in view). Interval number 4 continues until the self-test switch is released. When the self-test switch is released, the timer circuit returns to the conditions described in the interval number 1 discussion and remains in the interval number 1 condition until the self-test switch is actuated again. When the self-test switch is actuated again, the timer cycle (intervals 2, 3, and 4 of figure 11) is repeated.



Timer Circuit, Simplified Schematic Diagram
Figure 11


TEST INITIATE
T=0 SEC
T=+3 SEC
T=+23 SEC
3 SEC TIMER
20 SEC TIMER
TEST ENDED (RELEASE TEST SWITCH)
A
+18 V
+7 V
B
+15 V
+11 V
+9 V
C
+18 V
0 V
D
+16 V
0 V
E
+32 V
+16 V
+0 V
F
+18 V
+7 V
G
+18 V
0 V
INTERVAL NUMBER
1
2
3
4
1
R48
20 SEC TIMER
Q14
F
FLAG ENABLE
Q13
CR10
R49
R47
G
FLAG ENABLE OUTPUT TO 844A-1 VOR/LOC INSTRUMENTATION AND 951A-1 GLIDESLOPE RECEIVER FLAG CIRCUITS

TPO-8896-014

(d) Audio Test Generator Circuits.

1. General.

The audio test generator circuits consist of a 900-Hz multivibrator; a divide by 6, divide by 10, and divide by 30 frequency counter; a 30-Hz sine-wave generator; a 9960-Hz multivibrator and frequency modulator; and the audio test generator output combining and switching circuits.

The 900-Hz multivibrator output is divided by 6, 10, and 30 to obtain the respective 150-, 90-, and 30-Hz square waves. During an ILS self-test, the 150- and 90-Hz square waves are combined in the glideslope and localizer combiner matrix to provide the proper up/left or down/right audio test signals. During a VOR self-test, the 150-, 90-, and 30-Hz square waves are added and filtered to provide a synthesized sinusoidal 30-Hz signal that frequency modulates (FM) the 9960-Hz multivibrator and is added to the multivibrator output to provide the VOR bearing test signal. In addition, the VOR bearing test signal is chopped at 900 Hz (from the 900-Hz multivibrator) to provide a complete VOR audio test signal that supplies both bearing and audio output tests.

The input to the audio test generator is +18 vdc and is applied from the timer circuit test enable output. The +18 vdc is applied to the audio test generator circuits throughout intervals number 3 and 4 as shown by the waveforms in figure 11. The output of the audio test generator is applied to the 1051B-1 VHF NAV Receiver for VOR and the localizer portion of both ILS self-tests (up/left and down/right), and to the 951A-1 Glideslope Receiver for both ILS self-tests. The desired test signal is switched to the audio test generator output by utilization of the VOR or ILS mode logic, test selector switches (on the 51RV-2B front panel or remotely located), up/left or down/right test switching transistors, and VOR and localizer blocking diodes.

2. 900-Hz Multivibrator. (Refer to figure 804, sheet 4.)

Assuming that a self-test switch is actuated, the +18-vdc output from test enable Q9 (timer circuit) is applied through R1 and VR1 to the 900-Hz multivibrator. The 900-Hz multivibrator is a free-running or astable multivibrator consisting of Q1, Q2, and their associated components. Resistors R2, R5, R6, and diodes CR1 and CR2 are part of the multivibrator bias circuit. These components form a voltage divider with the arm of potentiometer R5 the positive base-drive supply voltage for the multivibrator. Potentiometer R5 (900 FREQ) controls the frequency of the multivibrator output. Zener diode VR1 and diodes CR1 and CR2 provide temperature compensation for the multivibrator. The alternating saturation and inhibiting of each transistor stage results in a 900-Hz square-wave output developed across load resistor R3 for Q1 and R4 for Q2.

The 900-Hz multivibrator is a 2-stage oscillator using regenerative feedback to sustain oscillations. Assume that Q1 saturates and Q2 inhibits.

The collector voltage of Q1 is positive before Q1 saturates. As soon as Q1 saturates, the collector voltage drops to ground potential and this negative-going pulse is applied through C1 to the base of Q2 causing Q2 to inhibit. When Q2 inhibits, the collector voltage starts to increase due to the changing of C2 through R4. At the same time, the base voltage of Q2 begins to increase due to the charging of C1 through R8 toward the voltage level at the arm of potentiometer R5 (900 FREQ). As soon as the base voltage of Q2 reaches a certain level, Q2 saturates. The time required for the base voltage to reach the saturation point of Q2 is determined by the RC time constant of R8 and C1. When Q2 saturates, the collector becomes grounded and a negative-going pulse is applied through C2 to the base of Q1, causing Q1 to inhibit. The capacitor charging cycle repeats, only this time Q1 and its associated components are affected.

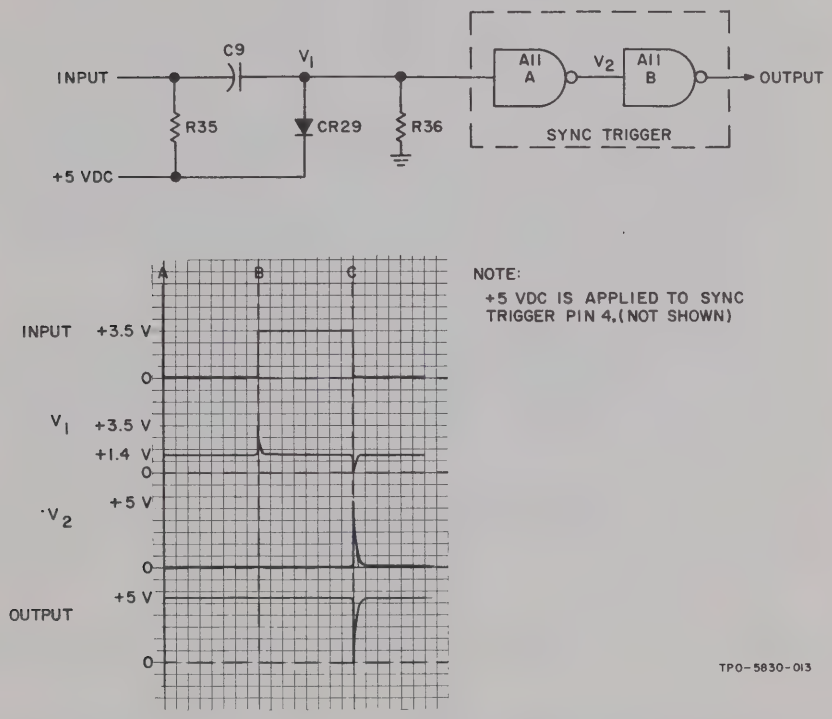
Frequency adjustment is obtained by varying the voltage level that can be applied to the bases of Q1 and Q2. The 900 FREQ control, R5, provides this adjustment. To decrease the output frequency, R5 would be adjusted so that the arm would be placed closer to ground (toward the anode of CR1). Less positive voltage would appear at the arm of R5 and at the bases of Q1 and Q2. Capacitors C1 and C2 would become almost fully discharged between their operating cycles. Therefore, it will take a longer period of time for the base voltage to reach the level required to saturate either transistor. Relating this to the multivibrator output results in a decrease of frequency because the time required for each transistor to go through a saturation and inhibit cycle has increased. If 900 FREQ control R5 was adjusted so that the arm was toward R2, each transistor would have a higher initial base voltage than was present when the arm of R5 was toward the anode of CR1. Capacitors C1 and C2 would not become fully discharged, and a shorter period of time would be required for the voltage at the bases of the transistors to reach the level required to saturate either transistor. Relating this to the multivibrator output results in an increase of frequency because the time required for each transistor to go through a saturation and inhibit cycle has decreased.

The proper output of the multivibrator is a 900-Hz square wave with an approximate dc level of +3.3 volts. The output is developed at the collector of either Q1 or Q2. The 900-Hz output is applied to counter networks A1 and A2 to provide the 150-, 90-, and 30-Hz signals required to synthesize the audio test signal outputs of the audio test generator.

3. Counters and Sync Trigger. (Refer to figure 804, sheet 4.)

Counter A1 divides the output of the 900-Hz multivibrator by 6, thus providing a 150-Hz square-wave output to inverter A12D. Counter A2 divides the multivibrator output by 5 and applies the resulting 180-Hz square wave to binary counter A7 and counter A3. Binary counter A7 applies its 90-Hz output to inverter A12C. Counter A3 divides its 180-Hz square-wave input by 6, thus providing a 30-Hz output to inverter A12B and to the input of the sync trigger.

The outputs of divide-by-6 counter A1 and divide-by-10 network A2 and A7 are synchronized to the 30-Hz output of counter A3 by synchronization circuits consisting of differentiator C9, R35, and sync trigger A11. The 30-Hz square-wave output of counter A3 is differentiated by C9 producing alternate positive and negative pulses. When a negative-going pulse is applied to C9, the output of sync trigger A11 goes to 0 volt.



Sync Trigger Input Circuit and Associated Waveforms
Figure 12

At point B, the leading edge of the input pulse is applied to C9. Capacitor C9 conducts the pulse, causing current through R36 and a +3.5-volt transient. The current through R36 drops as C9 charges to +3.5 volts. The positive transient occurring at point B is not present at the output of A11A because A11 is already saturated. Output V_2 remains at 0 volt until point C on the waveform.

At point C, the trailing edge of the input is applied to C9. The negative-going pulse causes V_1 to drop to 0 volt. This negative-going transient at V_1 is inverted by A11A to provide a +5-volt positive transient at V_2. Gate A11B inverts the positive transient and 0-volt level of V_2 to provide a +5-volt dc output with a negative transient at point C. The resulting negative-going transient, corresponding with the negative edge of the output from A3, causes A7 to become set (F output goes to logic 0) if A1

is in the reset condition, and also causes the output from counter A1 to go to logic 0. The divider outputs are therefore synchronized.

The 150-, 90-, and 30-Hz signals are applied to an inverter network consisting of NAND gates A12D, A12C, and A12B. These inverter networks are primarily buffer amplifiers included to prevent loading of the flip-flops. The inverted signals are applied to 150-Hz amplifier Q5, 90-Hz amplifier Q4, and 30-Hz amplifier Q3.

4. 150-Hz, 90-Hz, and 30-Hz Amplifiers. (Refer to figure 804, sheet 4.)

The bias circuits of the amplifiers are similar. Amplifier Q5 is supplied with +18 volts collector voltage through R18. This +18 volts appears on the cathode of CR5. The anode of CR5 is at approximately +4 volts dc provided by voltage divider R19 and R20. The 150-Hz signal is applied through R17 and the amplified signal is used in VOR test circuits and in ILS test circuits.

The 90-Hz amplifier Q4 has +18 volts dc applied to its collector. Resistors R14 and R15 divide the +18 volts dc to provide approximately +6.0 volts dc at the anode of CR4. The 90-Hz input is applied through R12 and the amplified signal is used in VOR test circuits and in ILS test circuits.

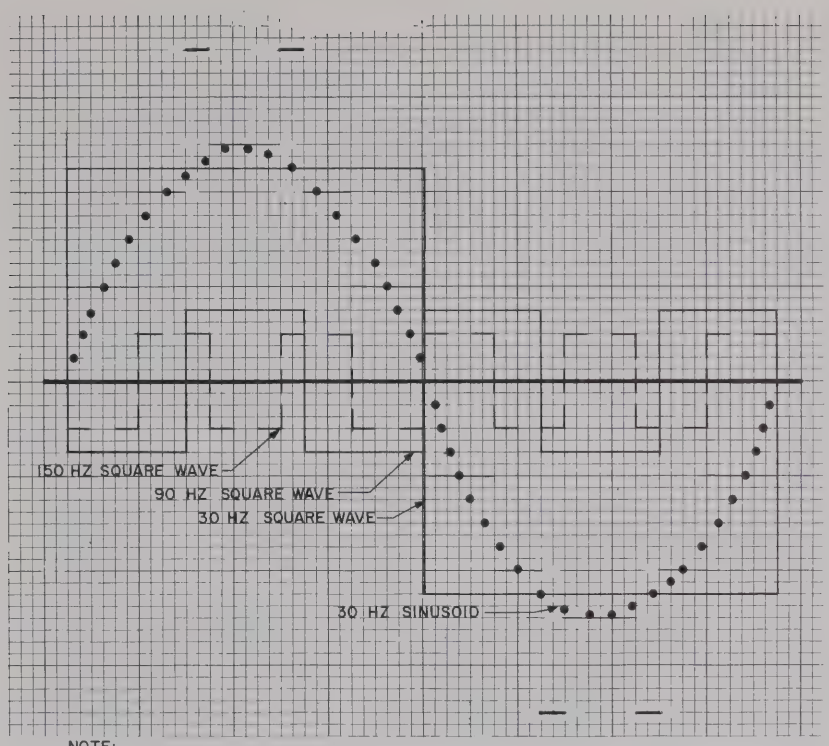
The 30-Hz signal from the divider circuit is coupled through R9 to the base of Q3. The collector of Q3 is at +18 volts dc applied through R10 and CR2. The 30-Hz input is amplified in Q3 and the output used in VOR test circuits.

5. 9960-Hz FM Multivibrator and Modulator. (Refer to figure 804, sheet 4.)

The outputs from the 150-, 90-, and 30-Hz amplifiers are combined in an RC combiner to form a 30-Hz sinusoid. The voltage divider consisting of R19 and R20 develops approximately +4 volts on the anode of CR5 to +4-volt amplitude. The voltage divider consisting of R14 and R15 develops approximately +6.0 volts on the anode of CR4, thereby limiting the 90-Hz square wave applied through CR4 to +6.0-volt amplitude. These two signals, combined with the +18-volt 30-Hz square wave, approximate a 30-Hz sinusoidal by canceling the first two odd harmonics from the 30-Hz square wave. Resistors R11, R16, and R21 and capacitor C3 provide filtering for further shaping the 30-Hz output. Figure 13 shows the square waves, their sum, and the filtered output.

The resultant 30-Hz signal is applied through C4 to the base of modulator Q6. This modulator drives a 9960-Hz multivibrator consisting of Q7, Q8, and associated components. The level of the 30-Hz output of modulator Q6 can be varied by adjusting 30-Hz LVL R86.

The 9960-Hz FM multivibrator circuit is similar to the 900-Hz multivibrator (paragraph 5.C.(5)(d)2.) except that the 9960-Hz multivibrator is frequency modulated by the 30-Hz signal applied from modulator Q6.

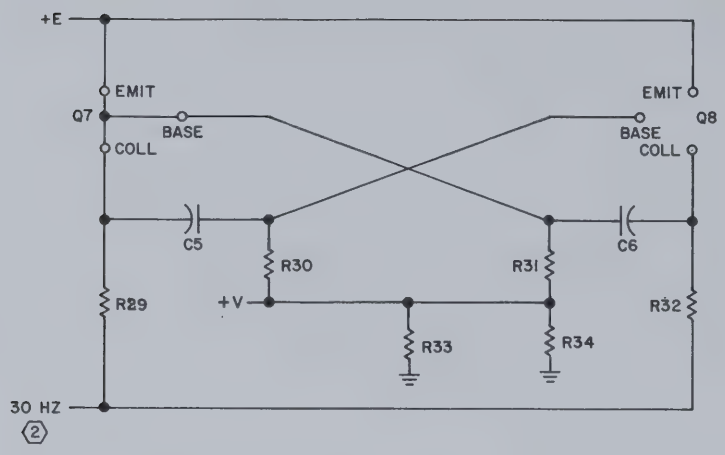

150 HZ SQUARE WAVE
90 HZ SQUARE WAVE
30 HZ SQUARE WAVE
30 HZ SINUSOID
NOTE:
THE LIGHTER, DISCONTINUOUS LINES REPRESENT THE ALGEBRAIC SUM OF THE SQUARE WAVES.
TPO-5850-013

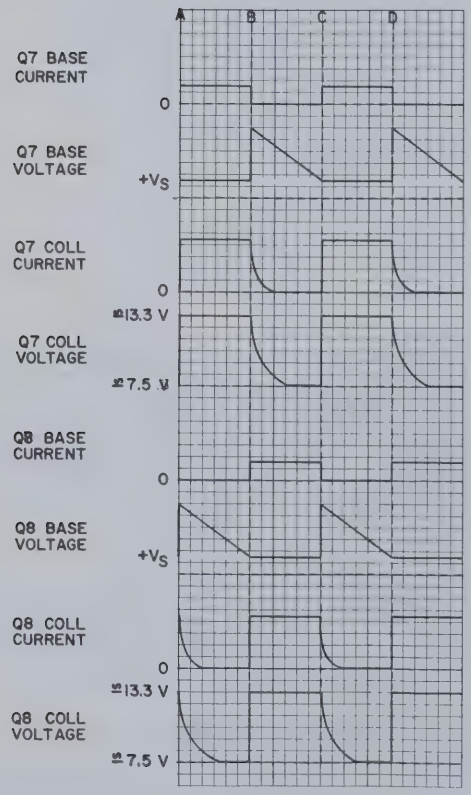
30-Hz Sinusoid Output of RC Combiner
Figure 13

The diagram (figure 14) shows an equivalent of the 9960-Hz multivibrator during the time that Q7 is saturated and Q8 is inhibited. The associated waveforms do not take into account the effect of the 30-Hz signal from the modulator. The following discussion first shows the operation of the free running or astable multivibrator and then shows the effects of the 30-Hz output of modulator Q6.

Points A and C on the waveform diagram describe the time that Q7 is saturated and Q8 is inhibited. When Q7 saturates, C5 applies a portion of the increased collector voltage to the base of Q8 and this voltage adds to the voltage $+V_S$ on the base of Q8 and causes Q8 to inhibit. Capacitor C5 now begins to discharge.

Point B on the waveform diagram is that point in time during which the Q8 base side of C5 has discharged to $+V_S$. Transistor Q8 saturates and Q8 base current is restored. The collector voltage of Q8 increases rapidly. Capacitor C6 applies a portion of the increasing voltage to the base of Q7 and this voltage added to the voltage $+V_S$ on the base of Q7 causes Q7 to inhibit. Transistor Q7 remains inhibited until the Q7 base side of C6 discharges to $+V_S$. The cycle then repeats. The output taken





NOTES:

1. THE EQUIVALENT CIRCUT CORRESPONDS TO POINT "A" ON THE WAVEFORMS.
2. 30 HZ SIGNAL NOT CONSIDERED IN PLOTTING OF THEORETICAL WAVEFORMS.
3. THE SYMBOL ≈ INDICATES APPROXIMATE VALUE.

TPO-5825-013

9960-Hz Multivibrator Equivalent and Waveforms
Figure 14

from the collector of Q8 is a 9960-Hz square wave. The 9960-Hz square wave results only when the 30-Hz output of modulator Q6 is neglected. Like the 900-Hz multivibrator, the frequency of the 9960-Hz multivibrator is established by the voltage applied from the arm of 9960 FREQ control R27 to the bases of Q7 and Q8. Diodes CR6 and CR7 provide temperature compensation for the multivibrator.

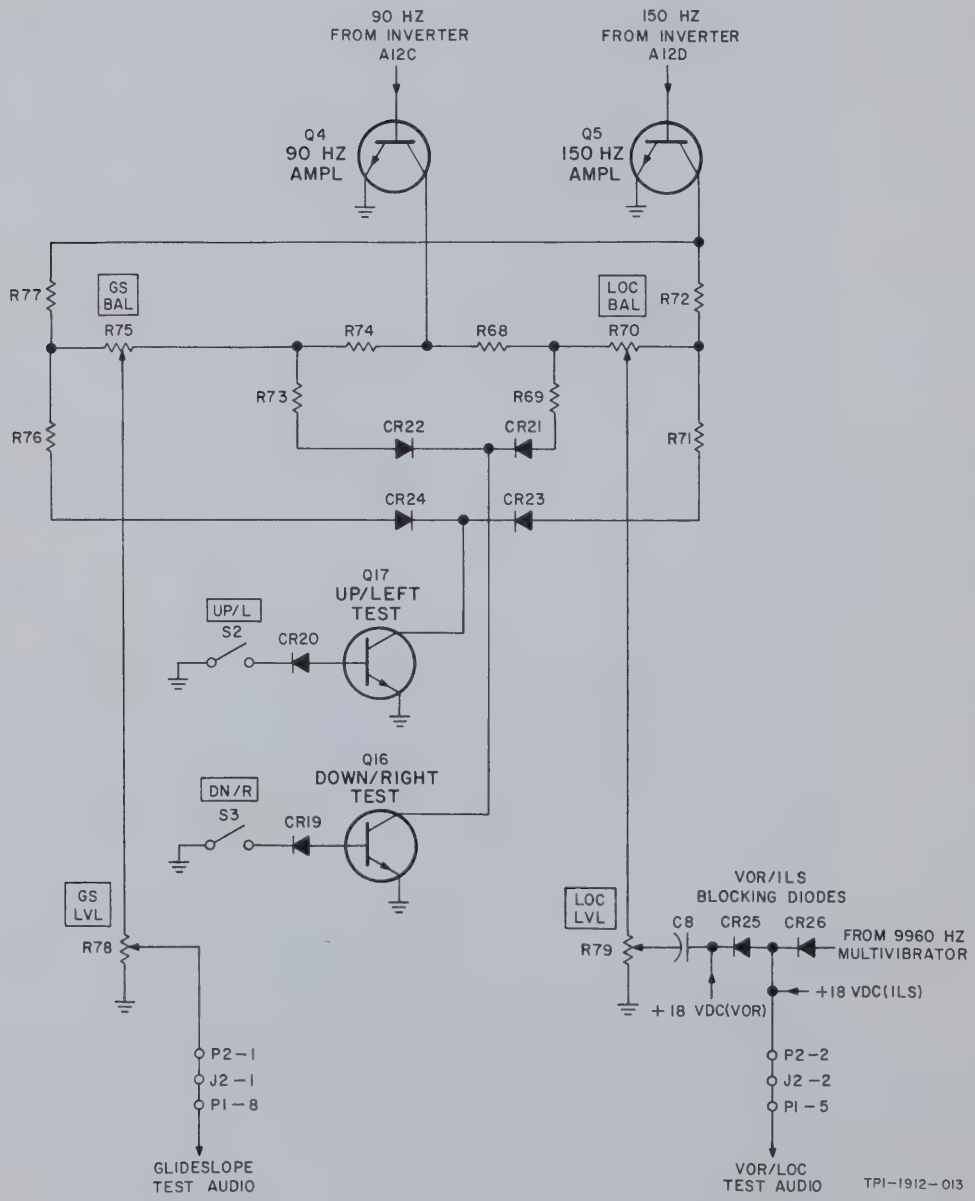
When the 30-Hz output of modulator Q6 is applied through R29 and R32 to the respective collectors of Q7 and Q8, and through VR2 to the emitters of Q7 and Q8, a 30-Hz signal is developed across R24 that is added to the 9960-Hz output at the collector of Q8. When the 30-Hz signal from Q6 is present, all of the 9960-Hz multibrator operating voltages are increasing and decreasing at a 30-Hz rate. This 30-Hz changing voltage results in the 9960-Hz multivibrator output having a 30-Hz signal added to the 9960-Hz signal. The voltage applied to the bases of Q7 and Q8 from the arm of 9960 FREQ control R27 will not change (increase and decrease) as much as the rest of the multivibrator circuit voltages because resistors R33 and R34 partially shunt the voltage from the arm of R27 to ground. Therefore, the output of the multivibrator becomes a 9960-Hz signal that is changing at a 30-Hz rate. Also, the values of R33 and R34 are such that the 9960-Hz signal varies between 9480 and 10,440 Hz at the 30-Hz rate. The resulting output now becomes a 9960-Hz FM signal that is changing at a 30-Hz rate. This signal is nearly identical to the 9960-Hz FM signal and 30-Hz reference phase signal provided by the VOR ground station. Capacitor C7 and VOR ZERO control R33 provide adjustment of the phase of the 30-Hz signal from modulator Q6.

6. VOR/LOC Test Signal Output Circuits. (Refer to figure 804, sheet 4.)

The 9960-Hz FM signal with AM component is applied through R80 to the VOR/ILS output circuit which contains two blocking diodes (CR25, CR26). The cathode of CR25 is connected to the +18-volt dc VOR input from the VOR/LOC mode relay. The cathode of CR26 is connected to the +18-volt dc ILS input. The VOR test signal output is applied through CR26 when the 51RV-2B is in VOR mode and a VOR test is in process. In this case the +18-volt dc VOR input to the cathode of CR25 reverse biases CR25 and the localizer test signal output is blocked. The VOR test signal output is blocked by CR26 when the 51RV-2B is in ILS mode. In this case the +18-volt dc ILS input reverse biases CR26 and forward biases CR25, thereby enabling the localizer test signal to be applied as the output. When the VOR test signal output is enabled, 900-Hz amplifier Q18 adds a 900-Hz audio component to the VOR test signal output. Transistor Q18 has the 900-Hz signal from the 900-Hz multivibrator applied to its base through CR27 and CR28. The 900 Hz is amplified by Q18, and chops the output of the 9960-Hz multivibrator to produce the composite VOR test signal that is applied to the 1051B-1 VHF NAV Receiver circuits.

7. Glideslope/Localizer Combiner. (Refer to figure 15.)

The glideslope/localizer combiner consists of resistors R68 through R79 and diodes CR21 through CR24. The other related components shown in figure 14 provide switching and blocking for the input and output of the combiner.



Glideslope/Localizer Combiner, Simplified Schematic Diagram
Figure 15

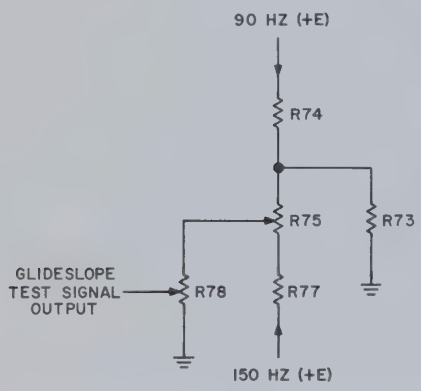
Equal amplitude 90- and 150-Hz signals are applied to the combiner by 90- and 150-Hz amplifier Q5. The function of the combiner circuit is to combine the 90- and 150-Hz signals so that the outputs provide up/left and down-right deviation indications of 75 ±2 ua on the cockpit indicators. When no ILS self-test is in process, transistors Q16 and Q17 are saturated (the biasing circuits for Q16 and Q17 are not shown in figure 14). With Q16 and Q17 saturated, the cathodes of CR21 through CR24 are placed at ground, causing CR21 through CR24 to become forward biased. The four diodes remain forward biased until a self-test is initiated. Outputs from the 90- and 150-Hz amplifiers Q4 and A5 are present only when a self-test is in process, and then only after the 20-second times operation and the corresponding test enable output has begun (intervals number 3 and 4 of figure 11). In order to initiate an ILS self-test, either the UP/R or DN/L test switches on the 51RV-2B or the removely located self-test switches must be actuated. Actuating either of the ILS self-test switches causes either Q16 or Q17 to inhibit, thereby modifying the resistive voltage divider network of the combiner. Assume that UP/L test switch S2 is actuated. Up/left test transistor Q17 inhibits and removes the ground from the cathodes of CR23 and CR24, causing these two diodes to become reverse biased, thereby effectively removing R71 and R76 from the combiner circuit.

Consider just the glideslope portion of the combiner. Figure 16 shows both the up/left and down/right glideslope configuration of the combiner, and their equivalent circuits. The following analysis of the glideslope configuration is also applicable to the localizer circuits as well.

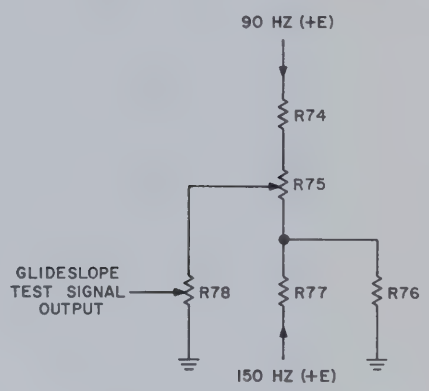
Potentiometer R75 (GS BAL control) varies the ratio of the 90-Hz signal amplitude with respect to the 150-Hz signal amplitude. Potentiometer R78 (GS LVL) varies the level of the test signal output. Assume that the tap on R75 is centered. The glideslope up/left test configuration can be reduced to the 90/150-Hz equivalent shown in figure 16. Use of voltage division yields a value for V_{90} of .27E, where E is the input level of the 90-Hz signal. Voltage division yields a value of V_{150} of .32E. The voltage V_{90} is the voltage level of the 90-Hz signal that is developed at the tap of R75. The voltage V150 is the voltage level of the 150-Hz signal that is developed at the tap of R75. The tapped level of the 90-Hz signal is less than the tapped level of the 150-Hz signal for the up/left test. The combined signal therefore, simulates aircraft ILS reception for the case in which the receiver is receiving the 150-Hz lobe (lower lobe) of the glideslope signal stronger than the 90-Hz lobe (upper lobe) of the glideslope signal. The glideslope pointer will therefore deflect up.

Similarly, the down/right test configuration of the combiner can be shown to yield a voltage V_{90} equal to .32E and V_{150} equal to .27E when the tap on R75 is centered. This will cause the glideslope pointer to deflect down because analogously the receiver is receiving the 90-Hz signal too strong and the aircraft must be flown down to equalize the signal strength. The glideslope test signal output is taken from the tap on R75 and subsequent potentiometer R78. The localizer test signal output is taken from the tap

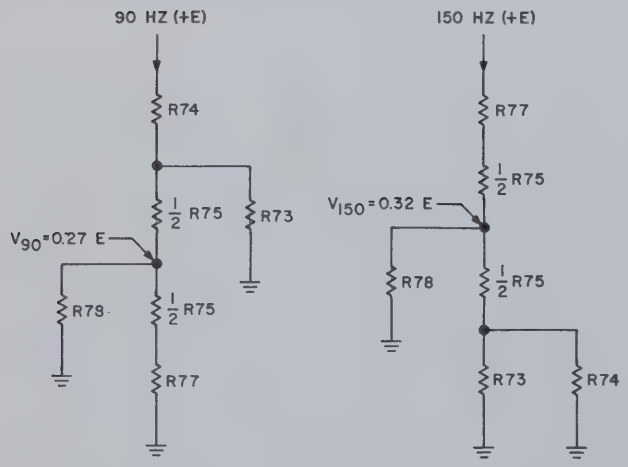
GLIDESLOPE UP/LEFT TEST CONFIGURATION



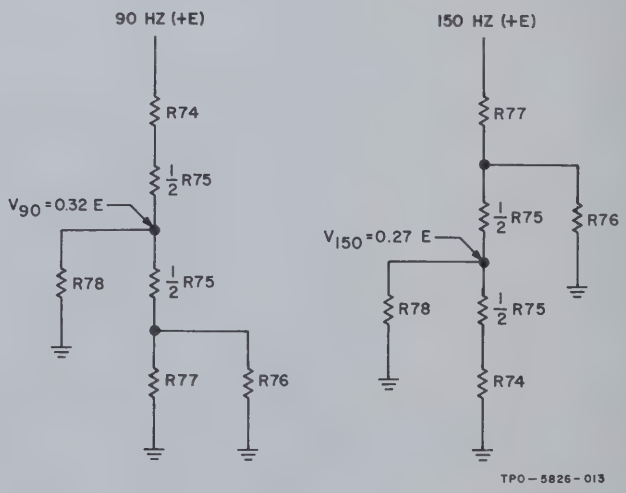
GLIDESLOPE DOWN/RIGHT TEST CONFIGURATION



90/150 HZ EQUIVALENTS



90/150 HZ EQUIVALENTS



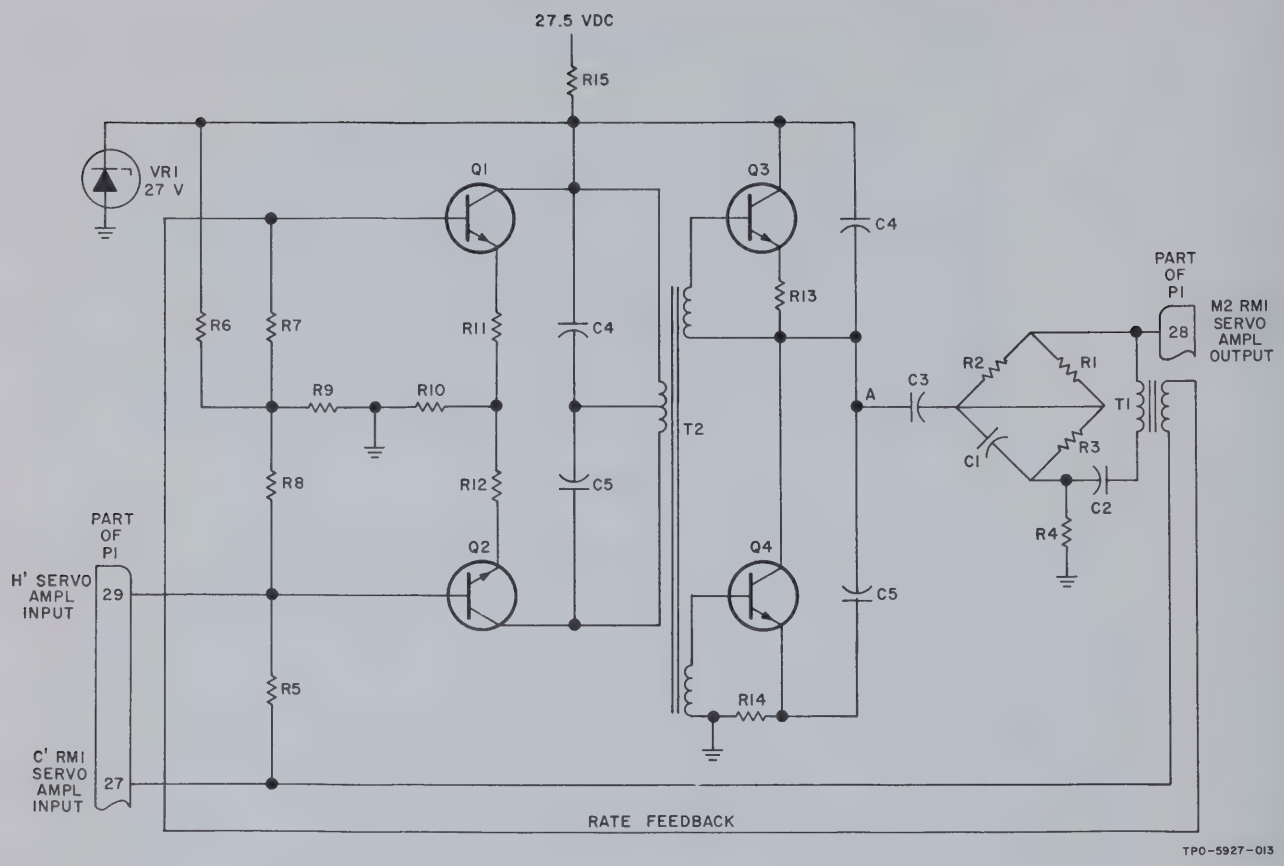
Glideslope/Localizer Combiner Test Equivalents
Figure 16

on potentiometers R70 and R79. Summarizing, when an up/left is in process, the combiner output has a stronger 150-Hz component, whereas a down/right self-test yields a stronger 90-Hz component.

The 90- and 150-Hz localizer test signal output and the VOR test signal output are both brought out to rear connector P1-5 on the 1051B-1 VHF NAV Receiver. When the 51RV-2B is tuned to a VOR frequency, +18 vdc is applied to the cathode of CR25 and reverse biases CR25. The 90- and 150-Hz localizer test signal output is blocked, and does not appear at P1-5. However, CR26 is forward biased, thereby allowing the VOR test signal to be applied to P1-5. When a localizer frequency is selected, CR25 is forward biased and CR26 is reverse biased due to the +18-vdc ILS voltage at the cathode of CR26. The 90- and 150-Hz localizer test signal is applied to P1-5 while the VOR test signal is blocked by CR26.

(6) RMI Servo Amplifier. (Refer to figure 17.)

The input signal for the RMI servo amplifier is applied through P1-27 and -29 to the base of driver amplifier Q2. The output of Q2 is coupled to amplifier-switches Q3 and Q4 through transformer T2. The primary of T2 is tuned to approximately 400 Hz. When the signal in the secondary of T2 is such that the base of Q3 is positive, Q3 will be turned on and the voltage at point A will be close to ground potential. The voltage between point A and ground, therefore, is an alternating voltage with a frequency equal to the frequency of the input signal. The output of the RMI servo amplifier is applied to one of the two windings of the RMI motor through C3, a bridge circuit, and P1-28. The bridge circuit provides a negative feedback voltage approximately proportional to the speed of the servo motor. This negative (rate) feedback allows the amplifier to be sensitive around the null position and yet stable. With the motor stopped, the rate feedback bridge circuit is designed so that the voltage across R3 and C1 lags that across R1 and R2 by the same amount that the voltage across the motor winding (RMI output) leads that across R4. When the motor is operating due to an error signal at the servo amplifier output, a back emf is developed in the motor winding proportional to the speed of the motor. The back emf unbalances the bridge, producing a voltage that is fed back to the input of the amplifier (Q1 base) through transformer T1. As the motor approaches the null position, the error signal becomes small, and motor speed is reduced. This results in less negative feedback voltage being developed. The gain of the amplifier is then increased in the sense that a smaller feedback signal results in a larger error signal at the input. If the motor continues to turn due to armature inertia at a position very near the null, the magnitude of the feedback voltage exceeds that of the error input voltage. The feedback signal, when amplified, attempts to rotate the motor in the opposite direction. The feedback signal then acts as a brake, bringing the motor to a halt at the null.



RMI Servo Amplifier, Simplified Schematic Diagram
Figure 17

(7) +18/+5-Volt DC Power Supply (Z6).

(a) General.

The +18/+5-volt dc power supply consists of a +20.2-volt variable switching preregulator followed by a +18-volt series regulator with current limitation of 2 amperes. The +18-volt output is supplied to the dc-to-dc inverter to supply +5 volts.

(b) +18-Volt Power Supply. (Refer to figure 804, sheet 1.)

The +27.5-volt dc input to the +18/+5-volt dc power supply Z6 is applied to an input filter network consisting of C7, L3, C9, R31, VR1, and C11. The input filter network suppresses incoming high-frequency transients and prevents switching transients from being conducted back to the input. Breakdown diode VR1 limits all input voltages to +82 volts.

Resistor R11 and breakdown diode VR2 comprise a starter circuit. When +27.5 volts dc is applied, VR2 breaks down, allowing a small amount of current to be applied through R13, R14, and R15. This current is enough to apply a voltage to the emitter of reference amplifier Q7, causing it to conduct. Conduction of Q7 applies a voltage to the base of Q6, one-half of the timing multivibrator. At initial turn-on, Q5 of the timing multivibrator will conduct because voltage divider R8 and R7 applies a fixed bias of approximately 1 volt to the base. Transistor Q5 continues to conduct until a bias potential is applied to the base of Q6. Capacitor C10, in the base circuit of Q6, begins to charge when Q7 begins conducting. When Q10 becomes fully charged, Q6 goes into saturation, raising the voltage across R6 and causing Q5 to inhibit by raising the emitter voltage of Q5. Saturation of Q6 causes switch driver Q4 and switch Q3 to saturate. Starting circuit R11 and VR2 is bypassed when Q3 begins to conduct. The output of Q3 is applied through inductor L4. As the current through L4 increases from 0 to 3 amperes, capacitor C13 charges, causing a voltage drop across the parallel resistive path of R18, RT1, and R20. This voltage drop forward biases the emitter-base junction of current sensor Q8, allowing Q8 to conduct, and also raises the voltage on the base of the reference amplifier Q7. Increasing the base voltage of Q7 inhibits Q7 and removes the drive for Q6, causing Q6 to inhibit. With Q6 inhibited the emitter voltage of Q5 decreases causing Q5 to become saturated and rapidly discharge C10. This rapid discharge produces a negative spike that regeneratively inhibits Q6. Transistor Q6 remains cut off until C10 becomes charged again. Inhibiting Q6 cuts off Q4 by raising the base voltage of Q4. With no current through Q4, switch Q3 inhibits, allowing the current through L4 to exponentially decay, thus causing the voltage at Z6TP1 to decrease. When Q3 is inhibited, diode CR8 provides a ground path for the current resulting from the collapsing field of L4. As the current in L4 decreases, the voltage across R18 decreases until the emitter-base junction of current sensor Q8 is no longer forward biased; this inhibits Q8, which allows Q7 to saturate. Saturation of Q7 again charges C10 and drives Q6 to saturation. Saturation of Q6 drives Q4 and Q3 into saturation, raising the voltage at Z6TP1. This action continues until the output at Z6TP1 is +20.2 volts. The resultant waveform at Z6TP1 is a sawtooth varying between 20.1 and 20.3 volts.

Current sensor Q8 saturates only when the load current exceeds 3 amperes which ultimately causes Q3 to inhibit. Potentiometer R14 adjusts the voltage divider of reference amplifier Q7, setting the regulation voltage output at TP1. The on time of Q3 will be significantly less with high input voltage conditions (31 volts) while the off time will be controlled by the charge time of C10. With low input voltage conditions (21 volts), the off time will be controlled by the charge time of C10, and Q3 will remain saturated.

RT1 is a negative temperature coefficient thermistor which ensures that the voltage drop across R18 is applied to the base of current sensor Q8 under cold temperature conditions. Failure to ensure the full voltage drop would allow overloads on the power supply to draw more than 3 amperes, which would cause Q3 to exceed its current rating.

Current amplifier Q10 begins to conduct as soon as the voltage on the collector exceeds the 5.1 breakdown voltage of VR4. Base bias is provided through RT2 and R22.

The voltage from the emitter of Q10 is filtered by C15 and C16. Resistors R28, R29, R30, and R32 establish the base bias of reference amplifier Q12. Reference amplifier Q12 conducts and raises the voltage applied to the base of amplifier Q11. With the proper bias level set, Q11 conducts, providing a voltage drop across R21 and lowering the base voltage of Q9, causing Q9 to conduct. The rate of conduction of Q9 regulates the base voltage of Q10 and thus the emitter output. The +18.0-volt adjust potentiometer resistor R29 is adjusted to provide the proper bias level to maintain a +18-volt output.

VR3, CR10, CR11, and VR5, CR14, CR15 are identical negative temperature coefficient circuits to ensure an equal change in both the +20.2-volt preregulator and the +18-volt series regulator.

The +18-volt dc power supply is capable of withstanding incoming transients of +82 volts for long durations. It is also short-circuit proof. Shorting the +18-volt output will apply a ground to the emitter of current amplifier Q10 which inhibits Q12, Q11, and Q9, leaving only thermistor RT2 and resistor R22 to provide base bias for Q10. During a short-circuit condition, the +18-volt supply will deliver only 700 milliamperes of current to ground.

(c) +5-Volt DC-to-AC Inverter and Rectifier. (Refer to figure 804, sheet 1.)

The +5-volt output is provided by a dc-to-ac inverter and rectified by a full-wave rectifier, producing a ripple-free output. The dc-to-ac inverter consists of a saturable core multivibrator which oscillates at 20 kHz.

Starting oscillation of the circuit depends on an unbalance existing between the apparent identical circuits of transistors Q1 and Q2. Because of the unbalance, there will be more current in one of the primary windings of transformer T1 than in the other.

Assume that there is more current through primary transformer winding 2-3; transistor Q2 saturates and the transformer core flux increases to the positive saturation region. The increasing core flux induces positive potentials on transformer windings 1-2, 4-5, and 5-6. The base of Q2 is made more positive by the current through CR1, driving Q2 to saturation while the base voltage of Q1 is made more negative, driving Q1 to cutoff. The flux in the core changes at a relatively constant rate until positive saturation is reached. At core saturation, further increase in current does not increase the flux in the core. Since the flux remains comparatively constant, no voltage is induced in windings 1-2, 4-5, and 5-6. The induced voltages fall to zero, removing the base drive current of Q2, thus inhibiting Q2.

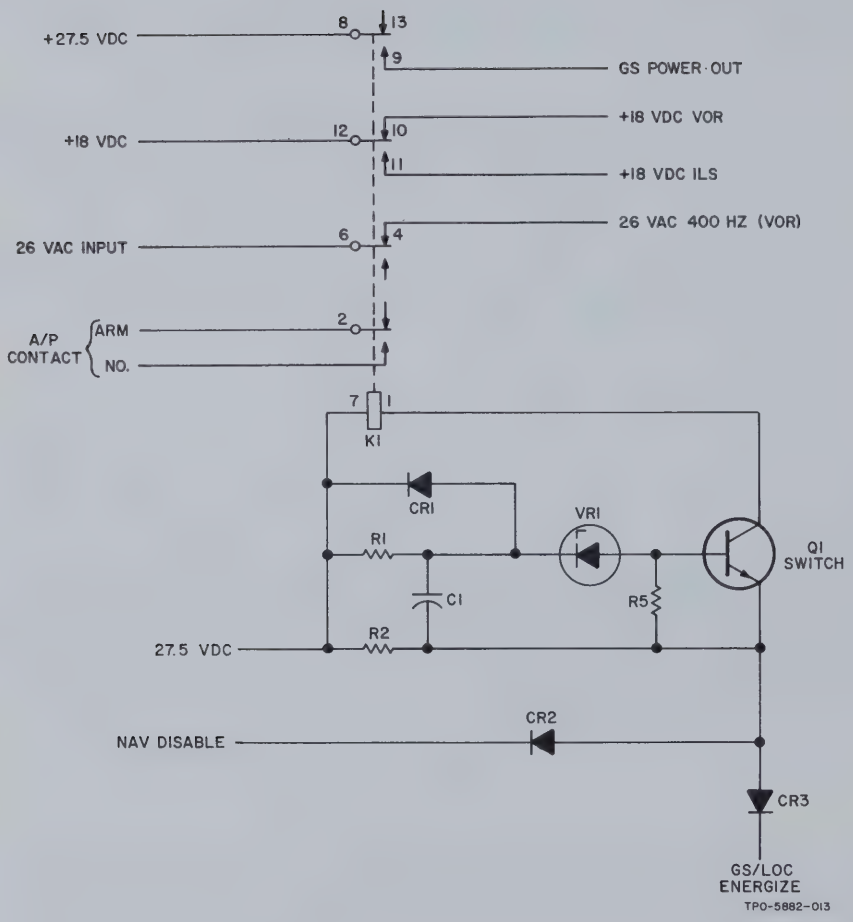
With the reduction of current in winding 2-3, the flux in the core begins to fall. Due to this small decrease of flux, voltages of polarity opposite to that which previously existed are induced in all transformer windings. Transistor Q2 is driven further into cutoff by the negative potential on the base from the feedback winding 4-5. Transistor Q1 is driven to saturation by the positive potential on its base from feedback winding 6-5. The flux in the core, therefore, is driven from positive saturation when Q2 is conducting to negative saturation when Q1 is conducting. Once negative saturation is reached, the switching of transistor Q1 from saturation to cutoff and Q2 from cutoff to saturation occurs; the cycle repeats. Resistor R1 and capacitor C2 suppress transients from the collectors of Q1 and Q2.

The output voltage developed across secondary windings 8-7 and 8-9 is a 20-kHz square wave with an amplitude of 10 volts peak to peak. The 10-volt signal is rectified by a full-wave rectifier consisting of CR2 and CR3.

The switching frequency ripple is filtered by capacitor C3, inductor L2, nad capacitor C5. Capacitor Z1C4 provides additonal filtering and Z1VR1 is connected to the +5-volt output as a protective device. Breakdown diode VR1 will clamp the output at 6.8 volts if the +5-volt inverter should fail.

(8) VOR/LOC Mode Relay. (Refer to figure 18.)

The distribution of power to the VOR/LOC circuits is controlled by the VOR/LOC mode relay, K1. When the 51RV-2B is tuned to an ILS frequency or when the NAV disable circuits are actuated, a ground is applied through CR3 or CR2 to the emitter of Q1. Capacitor C1 begins to charge as a result of current flow through R1. This causes a rise in the voltage at the cathode of VR1. When the voltage on the cathode of VR1 reaches approximately +10 volts, Q1 becomes forward biased. With Q1 forward biased, K1 is grounded through the collector-emitter junction of Q1. Relay K1 energizes and power is applied to the ILS circuits.



VOR/LOC Mode Relay, Simplified Schematic Diagram
Figure 18

1051B-1 VHF NAV Receiver Planar Assembly - Disassembly

1. GENERAL.

This section presents instructions for disassembling the 1051B-1 VHF NAV Receiver Planar Assembly. The 1051B-1 VHF NAV Receiver should be disassembled only when repair is necessary.

NOTE: The 1051B-1 VHF NAV Receiver should be removed from the 51RV-2B dust cover. Refer to the 51RV-2B VOR/ILS Receiver Overhaul Manual (523-0760757) disassembly section for procedures to remove the 1051B-1 VHF NAV Receiver.

Procedures are in order of disassembly from the highest to the lowest subassembly. Disassemble only as far as indicated by the nature of the fault. The order of disassembly of electronic equipment can usually be determined by inspection. Special techniques, cautions, warnings, and unique procedures, when required, are in this section.

2. PRECAUTIONS AND GENERAL TECHNIQUES.

Mark or otherwise identify all disconnected electrical wiring. Make note of color coding, placement of leads, and methods of applying insulation (if any) before unsoldering or removing any electrical parts.

CAUTION: WHEN UNSOLDERING A SOLID-STATE DEVICE, USE A HEAT SINK ON THE LEAD TO PREVENT DAMAGE TO THE SEMICONDUCTOR.

BE SURE POWER CABLE IS REMOVED BEFORE DISASSEMBLING ANY PORTION OF THE EQUIPMENT. DISASSEMBLING THE EQUIPMENT WITH THE POWER CABLE CONNECTED MAY CAUSE VOLTAGE TRANSIENTS THAT COULD DESTROY TRANSISTORS.

3. REMOVAL OF CARDS AND COVERS FROM SIDEBOARD. (Refer to figure 4.)

A. Audio Test Generator and Timer Z2.

Remove card Z2 by removing 10 screws securing card to sideboard Z1. Lift card straight off to avoid bending connector pins.

B. Cover Removal.

Access to all other components may be gained by removing screws and covers from shielded compartments.

NOTE: Refer to the repair section for detailed procedures on removal and replacement of flatpacks contained on audio test generator and timer card Z2.

1051B-1 VHF NAV Receiver Planar Assembly - Cleaning

1. GENERAL.

This section presents instructions for cleaning parts and disassembled subassemblies of the 1051B-1 VHF NAV Receiver Planar Assembly.

Instructions are arranged to facilitate reference by paragraph to the procedure for cleaning. All parts requiring particular methods of cleaning are considered separately, and parts similar enough to permit identical cleaning procedures are grouped.

2. CLEANING MATERIALS.

The use of the word solvent in the following procedures means Freon solvent. The cleaning materials referred to are listed in figure 201.

In this section, air jet refers to a hand-operated air nozzle supplied with clean, dry, compressed air at a maximum of 28 psig.

WARNING: WEAR GOGGLES WHEN USING AN AIR JET TO BLOW DUST AND DIRT FROM EQUIPMENT. WARN OTHER PERSONS TO KEEP AWAY FROM HAZARDOUS AREA OR WORK ENCLOSURE.

MATERIAL	RECOMMENDED TYPE
Cleaning solvent, Freon	Allied Chemical Corp Genesolv DTA or EI Dupont (Freon) TF/Methylene Chloride (TMC) (See figure 401 for details on solvent.)
Chamois skin	
Cloth, lintless cotton	
Paper, fine grade tissue	Kimberly-Clark Corp. Kimwipes or equivalent

Cleaning Materials
Figure 201

3. PROCEDURES

A. Cables, Covered.

(1) Clean outer surfaces of flexible Vinylite conduit by wiping dirt from surfaces with a dry lintless cloth.

(2) Treat any connector terminals as directed in paragraph C. Wipe lug terminals clean with a dry lintless cloth.

B. Chassis, Wired.

The following cleaning procedures should be used for chassis and sideboards containing terminal boards, resistor and capacitor assemblies, rf coils, inductors, transformers, and other wired parts.

(1) Remove dust and dirt from all surfaces, including parts and wiring, using soft-bristled brushes in conjunction with air jet.

CAUTION: AVOID AIR-BLASTING SMALL COILS, LEADS, AND OTHER DELICATE PARTS BY HOLDING AIR JET NOZZLE TOO CLOSE. USE CAUTION IN USE OF BRUSHES ON DELICATE PARTS.

NOTE: When necessary to disturb the dress of wiring and cables, dressing should be noted and wiring and cables restored to dress after cleaning is completed.

(2) Clean jacks as instructed in paragraph E.

(3) With minimum disturbance of wiring, clean connectors as prescribed in paragraph C.

(4) Clean ceramic or plastic insulators by method given in paragraph D.

(5) Finish cleaning chassis and sideboards by wiping down all finished surfaces with a clean, dry, lintless cloth.

(6) Protect chassis from dust, moisture, and damage before inspection.

C. Connectors.

(1) Wipe dust and dirt from bodies and shells using lintless cloth lightly moistened with solvent. Wipe dry with a clean, dry, lintless cloth.

(2) Remove dust from inserts using a small soft-bristled brush and air jet.

(3) Wash dirt and any traces of lubricant from inserts, insulation, and contacts using solvent applied sparingly with a small brush.

CAUTION: DO NOT ALLOW SOLVENT TO RUN INTO SLEEVES OR CONDUIT COVERING ANY WIRES OR CABLES CONNECTED TO CONTACT TERMINALS OF THE INSERT.

(4) Dry insert with air jet.

D. Insulators, Ceramic or Plastic.

Clean all ceramic insulators and plastic standoff insulators as follows:

(1) Wipe with clean, dry, lintless cloth.

E. Jacks.

(1) Remove dust from exteriors with a small brush and air jet.

(2) Blow dust from interior of female contacts with air jet.

1051B-1 VHF NAV Receiver Planar Assembly - Inspection/Check

1. GENERAL.

This section presents instructions necessary to verify, by inspection, the condition of disassembled and cleaned assemblies of the 1051B-1 VHF NAV Receiver. Inspection will reveal defects that result from wear, damage, deterioration, or other causes. Detailed inspection procedures are arranged alphabetically. Refer to the repair section of this manual for replacement of defective parts.

2. PROCEDURES.

A. Capacitors.

Inspect capacitors for defects listed in figure 301.

DEFECT	MOLDED TYPE	CERAMIC TYPE
Case damage (cracks or breakage)	X	
Loose, broken, or corroded terminal studs, lugs, or leads	X	X
Loose, broken, or poorly soldered connections	X	X

Fixed-Capacitor Inspection
Figure 301

B. Chassis.

Inspect chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, or damaged fastener devices. Inspect for corrosion and damage to finish that requires work in finishing department.

C. Connectors.

Inspect connector bodies for broken parts, deformed shells or clamps, and other irregularities. Inspect for cracked or broken insulation and for contacts that are broken, deformed, or out of alignment. Inspect for corroded or damaged plating on contacts and for loose, poorly soldered, broken, or corroded terminal connections.

D. Covers and Shields.

Inspect covers and shields for punctures, deep dents, and badly worn surfaces. Inspect for damaged fastener devices, corrosion, and damage to finish that requires work in finishing department.

E. Jacks.

Inspect jacks for corrosion, rust, loose or broken parts, cracked insulation, bad contacts, and other irregularities.

F. Laminated Circuit Boards.

Inspect laminated circuit boards for loose, broken, corroded, or poorly soldered terminal connections. Inspect laminated circuits for any evidence of damage, such as burned, broken, cracked, or corroded plating. Inspect for loose mounting of laminated circuit boards.

G. RF Coils.

Inspect rf coils for broken leads and loose, poorly soldered, or broken terminal connections. Inspect for crushed, scratched, cut, bruised or charred windings; corrosion on windings, leads, terminals, and connections; and for damage to forms.

H. Resistors.

Inspect fixed composition resistors for cracked, broken, blistered, or charred bodies and loose, broken, poorly soldered, or corroded terminal connections.

Inspect fixed wire-wound resistors for signs of heating; cracked, broken, or charred insulation; loose, poorly soldered, broken, or corroded terminal connections; and loose mounting.

I. Semiconductors.

Inspect diodes, silicon controlled rectifiers, and transistors for cracked, broken, blistered, or charred bodies. Inspect for loose, broken, poorly soldered, or corroded terminal connections.

J. Soldered Terminal Connections.

Inspect soldered terminal connections for cold-soldered or rosin joints. These joints present a porous or dull, rough appearance. Examine for excess of solder, protrusions from the joint, pieces adhering to adjacent insulation, and particles lodged between joints, conductor, or other parts. Inspect for insufficient solder and unsoldered strands of wire protruding from conductor at joint. Also, look for insulation that is stripped back too far from joint or badly frayed at joint. Inspect for corrosion (verdigris) on copper conductor at the joint.

K. Transformers and Reactors.

Inspect transformers and reactors for signs of excessive heating, damage to case, cracked or broken ceramic insulators, and other irregularities. Inspect for corroded, poorly soldered, or loose terminals, and loose, broken, or missing mounting hardware.

L. Wiring.

Inspect open and laced wiring of chassis, terminal boards, and parts of equipment by checking insulation for damage and charring. Inspect wires for breakage and for improper dress in relation to adjacent wiring and chassis.

1051B-1 VHF NAV Receiver Planar Assembly - Repair

1. GENERAL.

This section presents instructions for the replacement or repair of damaged or defective components of the 1051B-1 VHF NAV Receiver.

Detailed procedures are given for the replacement of connector contacts in the main sideboard thin-line connector Z1P1, and for replacement of pins in the blue-line connectors on the audio test generator and timer, Z2. Procedures are also given for the replacement of the connector contacts protruding from the sideboard that mate with the blue-line connectors on card Z2.

Faulty parts are usually detected through procedures in the inspection/check section, testing section, or troubleshooting section of the manual. If a new part is to be installed, it should first be inspected and tested.

Most of the repair or replacement procedures apply to the disassembled 1051B-1 VHF NAV Receiver. Refer to the disassembly section for instructions.

Figure 401 lists the supplies and tools needed to repair the 1051B-1 VHF NAV Receiver.

NOTE: Special extraction and insertion tools are required for the replacement of the various types of connector contacts (pins) used in the 1051B-1. It is recommended that substitute tools are not used. Failure to use the proper tools may result in damage to the connectors or to the printed circuits on the boards.

2. REPAIR TOOLS AND SUPPLIES.

Refer to figure 401 and ensure that the tools and supplies needed to perform the repair job are on hand.

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
GENERAL.		
Solder, 0.020-inch diameter, 60/40 energized rosin core or Solder, 0.015-inch diameter, 63/37 energized rosin core.	Cen-Tri-Core energized rosin core per QQ-S-51d or Kester 44 Sn 63 .015 solder, or equivalent.	Bond components to circuit board.
1544 rosin.	Kester 1544.	Facilitate soldering.

Repair Supplies (Sheet 1 of 6)
Figure 401

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Cleaning solvent, Freon (non-spray type). See NOTE 1 following figure 401.	Collins part number 005-1314-030 (10-gallon container) or Allied Chemical Corp Genesolv DTA or E.I. DuPont (Freon) TF/ Methylene Chloride (TMC).	Remove excess rosin flux and remove Dry-Film 88 coating.
Lintless tissue.	Kimberly-Clark Corporation, Kimwipes or equivalent.	Remove excess rosin flux and general cleaning.
Plastic pedestals.	Collins part number 767-1421-001	Spacer for flatpacks.
Adhesive.	Armstrong A12.	Secure pedestals to flat-packs.
Shielding braid.	Various, fine mesh of silver-plated braid is recommended.	Wicking solder from connecting pads on circuit boards.
Small brushes.	Various, but should have natural bristles. If added stiffness is desired, trim bristles to about 1/4-inch length.	Cleaning circuit board, connecting pads, leads, etc., before and after repairing and also for applying protective Dry-Film 88 coating.
Wooden toothpicks (round).	Various.	Soldering aids (commercial soldering aids may a'so be used).
Pipe cleaners (white).	Various.	Use for scrubbing individual connector pads with Freon solvent.

Repair Supplies (Sheet 2 of 6)
Figure 401

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Coating solution (silicon resin). See NOTE 2 following figure 401.	Dry-Film 88. Collins part number 005-0643-030 (1/2 pint) or Sperti Faraday Inc, Cooper-Hewitt Electric Co. Division, Dry-Film 88. WARNING: DRY-FILM 88 MUST BE USED. SUBSTITUTE COATINGS ARE NOT AUTHORIZED. NOTE: Dry-Film 88 is removed by the Freon cleaning solvent.	Coat and seal repaired areas and components.
Repair tools. NOTE: Repair tools list includes soldering iron, solder sucker, pin extraction and insertion tools, special pin removal jig, special pliers, soldering tip, and cutting tool. CONNECTOR PINS. NOTE: Connector pins and other parts needed for repair are individually listed for each connector. Refer to figure 4 for all connector locations. Pin placement in the connector is also given.	Required repair tools are listed in figure 1002.	To aid in the repair of the 1051B-1 VHF NAV Receiver.

Repair Supplies (Sheet 3 of 6)
Figure 401

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Main Sideboard.		
Rear connector Z1P1.		
(A) Contacts (pins), male, filter. Used in positions 1, 3, 5 thru 13, 15, 16, 25 thru 32, 37 thru 62, 64 thru 66, and 75 thru 80 of Z1P1. Total pins used is 56. NOTE: See (A) and (B) in figure 1002 for required extraction and insertion tools.	Collins part number 372-2516-050.	Filter contacts used to interconnect between circuits on sideboard Z1 and 51RV-2B interconnect unit connector.
Adapters, square shank (may or may not be required, refer to procedure).	Collins part number 768-3771-001.	Soldered between rear of above contacts and sideboard Z1 to provide connection between rear of contact and printed circuits on sideboard Z1.
(B) Contacts (pins), male, grounded. Used in positions 17 thru 20, 69 thru 72, and 74 of Z1P1. Total pins used is 9. NOTE: See (A) and (B) in figure 1002 for required extraction and insertion tools.	Collins part number 372-2516-040 or Cannon part number 031-1101-000. NOTE: Can be ordered from either Collins or Cannon.	Grounded contacts used to interconnect ground circuits on sideboard Z1 with connector shell of Z1P1 and with circuits on sideboard Z1.
Adapters, square shank (may or may not be required, refer to procedure).	Collins part number 768-3771-001.	Soldered between rear of above contacts and sideboard Z1 to provide connection between rear of contact and printed circuits on sideboard Z1.

Repair Supplies (Sheet 4 of 6)
Figure 401

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Ⓒ Contacts, coaxial, male. Used in positions A1 and A2 of Z1P1. NOTE: See Ⓒ in figure 1002 for required extraction tool.	Collins part number 372-2519-010 or Cannon part number 031-1066-000. NOTE: Can be ordered from either Collins or Cannon.	Accepts RG-196/U cable and provides interconnect between vhf tuner Z7 and VOR/LOC antenna (connector A1) and vhf injection from 680T-1 VHF Synthesizer (connector A2).
Connector Z1J2.		
Ⓓ Contacts, (pins), male. Used in all positions (8 total) of Z1J2. NOTE: See Ⓓ in figure 1002 for required contact removal and insertion tools.	Collins part number 372-2236-010 or AMP Inc. part number 85932-1. NOTE: Can be ordered from either Collins or AMP Inc.	Provides interconnect between sideboard Z1 and connector Z2P2 on audio test generator and timer Z2.
Connector Z1J3.		
Ⓔ Contacts (pins), male. Used in all positions (8 total) of Z1J3. NOTE: See Ⓓ in figure 1002 for required contact removal and insertion tools.	Collins part number 372-2236-010 or AMP Inc. part number 85932-1. NOTE: Can be ordered from either Collins or AMP Inc.	Provides interconnect between sideboard Z1 and connector Z3P3 on audio test generator and timer Z2.
Audio Test Generator And Timer Z2.		
Connector Z2P2.		
Contacts, female. Used in all positions (8 total) of Z2P2. NOTE: No extraction or insertion tool required.	Collins part number 372-2252-010 or AMP Inc. part number 85964-1. NOTE: Can be ordered from either Collins or AMP Inc.	Provides interconnect between audio test generator and timer Z2 and sideboard connector Z1J2.

Repair Supplies (Sheet 5 of 6)
Figure 401

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Connector Z2P3.		
Contacts, female. Used in all positions (8 total) of Z2P3. NOTE: No extraction or insertion tool required.	Collins part number 372-2252-010 or AMP Inc. part number 85964-1. NOTE: Can be ordered from either Collins or AMP Inc.	Provides interconnect between audio test generator and timer Z2 and sideboard connector Z1J3.

Repair Supplies (Sheet 6 of 6)
Figure 401

NOTE 1: The Freon cleaning solvent can be obtained through Collins only in 10-gallon containers. Smaller containers of Freon solvent may be obtained directly from either of the manufacturers listed in figure 401.

The Freon solvent has an unlimited shelf life when kept in a sealed container. When exposed to air (as it would be during use), evaporation occurs rapidly. Therefore, small quantities should be taken from the main container and put in small glass jars with tight fitting lids. Use only clean jars, and replace lids after use to prevent evaporation. The Freon solvent is also nonflammable and nonexplosive. The only precaution to be observed during use of the Freon solvent is to ensure that only the area or component being replaced and/or repaired comes in contact with the solvent. The Freon solvent removes the Dry-Film 88 protective coating. Any area cleaned with the Freon solvent must be recoated with the Dry-Film 88 coating. The Freon solvent also removes excess rosin flux, dirt, and oils. When an area (connecting pad, etc.) is cleaned with the solvent, the area will be left dry and completely free of any residue from the solvent or from rosin flux, dirt, or oils.

NOTE 2: The Dry-Film 88 silicon resin coating can be obtained through Collins by using the part number shown in figure 401. When ordering this part number, the quantity obtained will be 1/2-pint.

Dry-Film 88 silicon resin coating should be stored in a cool place in clean steel containers with tight fitting lids. Dry-Film 88 has a shelf life of 6 months. After 6 months time, the silicon solid content of Dry-Film 88 has increased sufficiently so that the solution (toluene-petroleum spirits) stability of Dry-Film 88 has decreased. After 6 months (or sooner if the consistency of the Dry-Film 88 has thickened from the original consistency), the Dry-Film 88 coating should be thinned to the original consistency using a thinner consisting of 1 part xylene and 4 parts petroleum spirits.

WARNING: DRY-FILM 88 HAS A LOW FLASH POINT AND IS HIGHLY FLAMMABLE WHEN IN A LIQUID STATE (UNTIL DRY). THEREFORE, DRY-FILM 88 SHOULD BE USED ONLY IN AREAS APPROVED FOR USE WITH FLAMMABLE MATERIALS. DO NOT EXPOSE DRY-FILM 88 TO EXCESSIVE HEAT OR TO OPEN FLAME. KEEP CONTAINER CLOSED WHEN NOT IN USE. USE DRY-FILM 88 ONLY WITH ADEQUATE VENTILATION. AVOID PROLONGED BREATHING OF VAPORS AND REPEATED CONTACT OF DRY-FILM 88 WITH SKIN.

3. REPAIR AND REPLACEMENT PROCEDURES.

A. Replacement of Resistors, Capacitors, and Diodes on Printed Circuit Boards.

(1) Removal.

NOTE: All references to solvent in the following procedures refers to the Freon solvent listed in figure 401. Other solvents are not recommended.

(a) Before removing diodes or polarized capacitors (electrolytics), note polarity markings and orientation on circuit board.

(b) Using a small cutting tool (small diagonal cutter), carefully cut both leads of component leaving about 1/16 inch of lead protruding from circuit board. Remove component.

NOTE: If it is desired to disconnect only one end of a component in order to allow component substitution (such as may be required during troubleshooting), refer to paragraph 3.A.(1)(f).

(c) With a small brush, sparingly apply solvent to cut component leads and to other end of leads on opposite side of circuit board. Ensure that solvent is applied to board where component leads pass through board.

(d) Grasp one of the cutoff leads (on component side of board) with small needle-nosed pliers. Apply soldering iron with a small amount of flux on tip to circuit board where lead passes through circuit board. Opposite side of board can also be used. If opposite side of board is used for unsoldering, ensure that the correct lead and circuit board point is located. As soon as solder melts, carefully remove cutoff lead from component side. Repeat for remaining cutoff lead.

(e) Using soldering iron, reheat point on circuit board from which a lead has been removed. When remaining solder melts, apply and actuate solder sucker to remove solder. Repeat for remaining lead. Use solder sucker as required until holes in board are clean (as indicated by no solder on the walls, top, or bottom of the holes in the circuit board).

NOTE: Final cleaning of the holes (in the circuit board) will be done just prior to installing new component.

(f) If only one lead is to be disconnected to allow for component substitution during troubleshooting, proceed as follows:

1. With small brush, sparingly apply solvent to one lead. Ensure that solvent is applied to circuit board where lead passes through board. Repeat for same lead on opposite side of circuit board.

2. From component side, grasp lead close to circuit board with small needle-nosed pliers.

3. From opposite side of circuit board, heat point on circuit board where lead passes through board. When solder melts, carefully lift lead upward until lead has cleared circuit board.

4. Repeat paragraph 3.A.(1)(e) and ensure that all solder is removed from hole.

5. Replace lead per procedures in paragraph 3.A.(2)(i).

(2) Replacement.

(a) Using solvent and tip of pipe cleaner, carefully scrub both sides of circuit board (holes, pads, etc.) from which component was removed.

(b) Bend leads of new component so that component fits freely into holes in circuit board.

(c) If component has polarity markings (electrolytics, diodes), ensure that component is orientated the same as the removed component. Insert new component through holes in circuit board. Ensure that component is flush with circuit board or is in the same position as the removed component.

NOTE: Component leads should not be bent or crimped to hold component in position prior to soldering. It is recommended that component leads remain straight when protruding through board. Keeping the leads straight makes component replacement easier and prevents damage to the circuit board when removing components.

(d) Use flux and solder sparingly and solder the component to circuit board from back side (side opposite components) of board. Do not use excessive heat. Ensure that position of component does not change during soldering.

(e) Carefully inspect solder joints to ensure that excess solder has not been used and that no short circuits are in evidence. Solder should fill the circuit board hole through which the component lead is inserted.

(f) Using small diagonal cutters or end nippers, snip excess leads from components. Cut leads so that remaining height above board matches that of other components (approximately 1/16 inch).

(g) If more than one component is being replaced, repeat the above paragraphs for each component (transistors, transformers, flatpacks, etc., are covered in following paragraphs). Mark or otherwise identify each component as it is being replaced.

(h) When all components that are to be replaced have been replaced, use a small brush or end of pipe cleaner and solvent to clean new solder joints. Ensure that all flux and solder rosin is removed. Use a round toothpick to aid in removal of heavy deposits of rosin. Solder joints should be smooth, bright, and clean when properly soldered and cleaned. Proceed to paragraph 3.D. for coating procedures.

(i) Replace single lead (from component on which one lead was lifted for substitution) by inserting lead through hole in circuit board and resolder to board. Use flux and solder sparingly. When complete, refer to paragraph 3.D. for coating procedures.

B. Replacement of Transistors, Transformers, and Encapsulated Circuits (Blue Modules) on Printed Circuit Boards.

(1) Removal.

(a) Note placement of tab or lead spacing, or of lead numbers before proceeding. With a small brush, sparingly apply solvent to the component leads on the back side of the circuit board (side opposite components), or to the front side of the circuit board if blue modules are being removed.

(b) Grasp the component with two fingers and alternately apply soldering iron with a small amount of flux on tip to each component lead, rocking component as each lead becomes unsoldered. Do not overheat circuit board. Repeat the alternate heating of leads and rocking of component until component is removed. (Blue modules can be cut from their mounting pads if desired, or each lead can be unsoldered individually. Lift each lead as it becomes unsoldered. Rocking of the blue module is not necessary.)

NOTE: A cup-shaped desoldering tip can also be used with the advantage that all leads are simultaneously unsoldered.

(c) Using soldering iron, reheat in turn each point on circuit board from which a lead has been removed. When remaining solder melts, apply and actuate solder sucker as required until holes in board are clean (as indicated by no solder on the walls, top, or bottom of the holes in the circuit board).

(2) Replacement.

(a) Using solvent and tip of pipe cleaner, carefully scrub both sides of circuit board (holes, pads, etc.) from which component was removed. For blue modules, scrub mounting pads on component side of circuit board.

(b) Insert new component into holes (or mounting pads for blue modules) on circuit board ensuring that component orientation (transistor tab, etc.) is same as component that was removed. Ensure that component height above (or flush with) circuit board is also same as component that was removed.

NOTE: Component leads should not be bent or crimped to hold component in position prior to soldering. It is recommended that component leads remain straight when protruding through board. Keeping the leads straight makes component replacement easier and prevents damage to the circuit board when removing components.

(c) Use flux and solder sparingly and solder component to circuit board from back side (side opposite components) of board. Blue modules are soldered to mounting pads from component side of circuit board. Do not use excessive heat. Ensure that position of component does not change during soldering.

(d) Carefully inspect solder joints to ensure that excess solder has not been used and that no short circuits are in evidence. Solder should fill the circuit board hole through which the component lead is inserted. On blue modules, solder should fill the center of the mounting pad.

(e) Using small diagonal cutters or end nippers, snip excess leads from components. Cut leads so that remaining height above board matches that of other components (approximately 1/16 inch). Leads on blue modules can be cut flush with mounting pads.

(f) If more than one component is being replaced, repeat the preceding procedures for each component. Mark or otherwise identify each component as it is being replaced.

(g) When all components that are to be replaced have been replaced, use a small brush or end of pipe cleaner and solvent to clean new solder joints. Ensure that all flux and solder rosin is removed. Use a round toothpick to aid in removal of heavy deposits of rosin. Solder joints should be smooth, bright, and clean when properly soldered and cleaned. Proceed to paragraph 3.D. for coating procedures.

C. Replacement of Integrated Circuits (Flatpacks) on Printed Circuit Boards.

(1) Removal.

NOTE: The 1051B-1 VHF NAV Receiver contains three flatpacks. All three flatpacks are located on the audio test generator and timer board Z2. Do not mistake the flatpacks for the three blue modules also located on board Z2. Replacement procedures are not the same for flatpacks and blue modules.

(a) Note position of printed dot in corner of flatpack relative to positioning of flatpack on circuit board.

NOTE: The procedures given in paragraphs 3.C.(1)(b) and (c) apply to the actual removal of a flatpack. However, if during troubleshooting, a single lead or several leads need to be lifted from their mounting pads, the procedures of paragraphs 3.C.(1)(b) and (c) should be followed. The leads should be replaced using the procedures of paragraphs 3.C.(2)(b) and (d).

(b) From component side of board, use a small brush and sparingly apply solvent to each flatpack lead and mounting pad (or to individual lead and pad if lead lifting is desired when troubleshooting).

(c) Using tweezers or small curved needle-nosed pliers, apply soldering iron with a small amount of flux on tip (modified per figure 1007) in turn to each flatpack lead and pad. Heat each lead until solder melts and lift lead just far enough to break connection with mounting pad. Hold lead away from pad for a few seconds so that resoldering will not occur when the lead is released. When all leads have been unsoldered, remove flatpack.

(d) Reheat each mounting pad and remove excess solder with a solder sucker.

CAUTION: AVOID USE OF EXCESSIVE HEAT ON MOUNTING PADS.

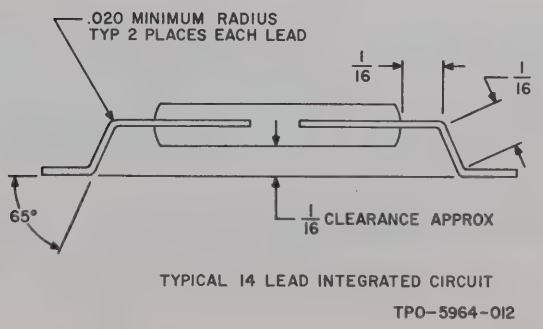
(2) Replacement.

(a) Prepare new flatpack for installation as follows:

1. Cement a plastic pedestal (Collins part number 767-1421-001) to bottom of flatpack using Armstrong A12 adhesive. (Pedestal provides proper spacing of flatpack from circuit board.)

2. Refer to figure 402 and carefully bend leads of flatpack using modified needle-nosed pliers (figure 1006). Do not cut excess leads.

NOTE: The dimensions and angles shown in figure 402 are approximate. The lead bends shown in figure 402 provide strain relief for the flatpack, and the dimensions shown, although approximate, should be maintained as closely as possible.



Flatpack Mounting Diagram
Figure 402

3. When leads are properly prepared, end portions of leads should be approximately 1/16 inch below and parallel to bottom edge of flatpack.

4. Temporarily position flatpack correctly (observe printed dot in lower corner) on circuit board. Using small diagonal cutters, cut all leads so that they extend to the end of, but not beyond, each respective mounting pad.

5. Use flux and solder sparingly and pretin each flatpack lead up to the first bend (lower bend in figure 402).

NOTE: Solder is permitted on the ascending portion of the lead, but not on the portion of the lead extending straight out from the flatpack.

(b) Using solvent and tip of pipe cleaner, carefully scrub top surface of flatpack mounting pad.

(c) Carefully position flatpack on mounting pads. Observe placement of printed dot in corner so that replacement flatpack is oriented the same as the original flatpack.

(d) While holding new flatpack in position, use a small amount of flux and solder and tack-solder four corner leads to mounting pads. Using flux and solder sparingly, solder remaining flatpack leads to mounting pads ensuring that good connections are made with no solder bridging between leads. Resolder four corner leads.

CAUTION: AVOID USE OF EXCESSIVE HEAT.

(e) Using small brush or end of pipe cleaner and solvent, clean new solder joints. Ensure that all flux and solder rosin is removed. Use a round toothpick to aid in removal of heavy deposits of rosin. Solder joints should be smooth, bright, and clean when properly soldered and cleaned. Proceed to paragraph 3.D. for coating procedures.

D. Protective Coating After Repairing.

CAUTION: THE FOLLOWING PROCEDURES SHOULD BE PERFORMED IN AN APPROVED AREA AS DISCUSSED IN NOTE 2 FOLLOWING FIGURE 401.

(1) Using a small brush, apply a liberal (but not heavy) amount of Dry-Film 88 protective coating to replaced component(s) and to both sides of circuit board (mounting pads, holes, and adjacent areas of board). Ensure that complete coverage is obtained and that new coating overlaps existing coating on adjacent areas of board.

(2) Set coated board aside for drying.

NOTE: Dry-Film 88 dries tack free in 10 to 20 minutes (depending on relative humidity) at +20 °C (+68 °F). Maximum cure time is 24 hours at +20 °C (+68 °F) and should be observed especially if large areas of the circuit board have been recoated. Once dry, Dry-Film 88 is not flammable. For small repair jobs, the circuit board can be returned to service after tack-free drying has occurred.

E. Replacement of Contacts (Pins) in Main Sideboard Rear Connector Z1P1.

NOTE: Terminology used in reference to Z1P1 in the following paragraphs is wiring side and mating side of the connector. The wiring side of Z1P1 is the side that faces and connects to circuits on sideboard Z1. The mating side of Z1P1 is the side with the contacts exposed (seen by viewing the complete 1051B-1 from the rear).

NOTE: Rear connector Z1P1 contacts are numbered consecutively from left to right, beginning with contact number 1 in the upper left hand corner (with 1051B-1 placed in normal or upright position). The upper right-hand contact is number 2. With the 1051B-1 in an upright position and viewed looking into the mating side of Z1P1, the contacts of the left vertical row are all odd numbered and the contacts of the right vertical row are all even numbered.

When counting the contacts, count each of the two coaxial connectors as four contacts (a coaxial connector occupies the same space as required for four of the filter or ground contacts). Contact numbering sequence does not skip over a coaxial connector and then continue. The coaxial connector must be counted as four contacts. (An example is the Z1P1 viewed from the mating side. From the top to the first coaxial connector are 20 contacts; the coaxial connector counts for four contacts, so the next left hand contact below the coaxial connector will be number 25, not number 21.)

(1) Removal.

NOTE: Rear connector Z1P1 contains three types of contacts: filter, ground, and coaxial. There are 56 filter contacts, 9 ground contacts, and 2 coaxial contacts in Z1P1.

(a) Filter and Ground Contacts.

1. Identify filter contacts by red-orange color and ground contacts by silver color when viewed from wiring side. Ensure that proper replacement contacts are on hand (contacts and contact positions shown in figure 401).

2. Place 1051B-1 on flat surface with component side of boards facing upward, and with mating side of rear connector Z1P1 facing technician (this places the odd-numbered contacts on the top horizontal row with contact numbers being on the right-hand end. The bottom horizontal row contains all even-numbered contacts).

3. Removing Odd-Numbered (Top Horizontal Row) Contacts.

   a. Determine correct contact to be removed.

   b. With curved small needle-nosed pliers, grasp adapter (described in figure 401 as interconnecting from wiring side of contact to sideboard Z1 circuits) on angled portion of adapter. On contacts without adapters (bus wire providing direct connection to circuits and/or components) grasp bus wire approximately 1/8 inch away from rear of contact.

   c. Apply soldering iron (small tip) with a small amount of flux to junction of adapter (or bus wire) and wiring side of filter or ground contact. When solder melts, carefully bend adapter downward away from rear of contact, being careful not to exert too much pressure at junction of adapter and circuit board, or slip bus wire off rear of filter contact.

   d. Remove filter or ground contact as follows, using extraction tool (A) listed in figure 1002.

      (1) Position sliding portion of tool toward end of handle. A small slot should be visible immediately under bottom tong of sliding portion of tool. (The slot is centered in the tool frame.)

      (2) From mating side of contact, insert tool around contact so that wide part of tool enters contact housing in wide slot where contact exits housing.

      (3) Carefully press tool into housing until end of contact (on mating side of connector) is in slot of tool (center of tool frame). Tong of sliding portion of tool should be in line with end of contact.

         NOTE: End of contact must be seated in the tool slot. If end of contact is not in tool slot, contact locking device (keeper) inside of connector housing will retain contact.

      (4) Push sliding portion of tool toward connector. Contact should unlock and slide toward wiring side of connector.

      (5) Remove contact and tool from connector housing.

4. Removing Even-Numbered (Bottom Horizontal Row) Contacts.

   a. Determine correct contact to be removed.

   b. If top horizontal row contact (immediately above bottom row contact to be removed) has an adapter on wiring end, remove adapter as follows. If top row does not have an adapter proceed to paragraph c.

NOTE: Top row adapter should be completely removed rather than bent out of the way. Excessive bending of adapter could damage circuits (holes, etc.) located on main sideboard.

(1) With curved small needle-nosed pliers, grasp adapter (on top row contact immediately above bottom row contact to be removed) on angled portion of adapter.

(2) Apply soldering iron (small tip) with a small amount of flux to junction of adapter (top row) and wiring side of associated top row contact. When solder melts, carefully bend top row adapter downward away from rear of contact being careful not to exert too much pressure at junction of adapter and circuit board.

(3) Using small brush, sparingly apply solvent to junction of top row adapter and circuit board (both sides of circuit board).

(4) Grasp top row adapter with needle-nosed pliers and apply soldering iron with a small amount of flux to back side of circuit board at hole where top row adapter comes through circuit board. When solder melts, remove top row adapter.

c. Position 1051B-1 with component side up and with mating side of Z1P1 facing technician.

d. With curved needle-nosed pliers, grasp bottom row adapter on angled portion of adapter.

e. Apply soldering iron (small tip) with a small amount of flux to junction of bottom row adapter and wiring side of associated bottom row contact. When solder melts, carefully bend adapter downward away from rear of contact being careful not to exert too much pressure at junction of adapter and circuit board.

f. Remove filter or ground contact as follows using extraction tool (A) listed in figure 1002.

(1) Position sliding portion of tool toward end of handle. A small slot should be visible immediately under bottom tong of sliding portion of tool. (The slot is centered in the tool frame.)

(2) From mating side of contact, insert tool around contact so that wide part of tool enters contact housing in wide slot where contact exits housing.

(3) Carefully press tool into housing until end of contact (on mating side of connector) is in slot of tool (center of tool frame). Tong of sliding portion of tool should be in line with end of contact.

NOTE: End of contact must be seated in the tool slot. If end of contact is not in tool slot, contact locking device (keeper) inside of connector housing will retain contact.

(4) Push sliding portion of tool toward connector. Contact should unlock and slide toward wiring side of connector.

(5) Remove contact and tool from connector housing.

(b) Coaxial Contacts.

1. Coaxial contacts are removed using extraction tool (C) listed in figure 1002.

2. From mating side of contact, insert barrel of tool over coaxial contact. Exert enough pressure on tool frame to cause barrel of tool to seat over coaxial contact.

3. Slowly press plunger knob on tool inward until plunger touches coaxial contact.

4. Using a small lightweight hammer, gently tap plunger knob. Coaxial contact should release and move out of connector housing toward wiring side of connector.

5. Remove coaxial contact and tool from housing.

(2) Replacement.

(a) Filter and Ground Contacts.

1. Place 1051B-1 on flat surface with component side up and with mating side of Z1P1 facing technician.

2. Replace even-numbered (bottom horizontal row) contacts as follows:

a. Ensure replacement contact is same as contact which has been removed (filter contact Collins part number 372-2516-050 or ground contact Collins part number 372-2516-040).

b. Insert new contact into proper bottom row position.

c. Seat new contact using insertion tool (B) listed in figure 1002. Place small end of tool over wiring side of connector and exert straight in pressure on tool until contact seats (do not exert sideward pressure on contact). When properly seated, both the mating end and wiring end of contact should be spaced from the connector housing the same as other contacts.

CAUTION: FAILURE TO INSERT THE CONTACT STRAIGHT INTO THE CONNECTOR HOUSING CAN RESULT IN DAMAGE OR DESTRUCTION TO CONTACT LOCKING DEVICE (KEEPER) LOCATED IN SIDE OF THE CONNECTOR HOUSING.

d. If adapter is not used on contact being replaced (bus wire providing connection to circuits and/or components), proceed to paragraph e. Adapter that goes to bottom row contact should be reusable if not damaged during contact removal. If damaged, remove bottom row adapter and insert new adapter (Collins part number 768-3771-001) through hole in circuit board. Using small curved needle-nosed pliers, bend adapter so that cup portion is just touching and resting underneath wiring side end of contact. If old adapter is used, straighten and place cup of adapter underneath wiring side end of contact.

e. Solder adapter on bus wire to wiring side end of contact. Use flux and solder sparingly. If new adapter is used, solder adapter to circuit board using flux and solder sparingly.

f. Using small brush and solvent, clean new solder joints (and both sides of circuit board hole if new adapter is installed).

g. Apply protective coating to circuit board per paragraph 3.D. if new adapter has been installed.

(b) Coaxial Contacts.

1. Insert coaxial contact into proper position in connector housing.

2. Using a soldering aid (on shank of small screwdriver) placed across the coaxial contact shoulder, snap contact into housing with a straight in pressure applied to soldering aid.

NOTE: Do not use point of soldering aid (or blade of screwdriver) to press against shoulder of coaxial contact.

F. Replacement of Contacts (Pins) in Main Sideboard Connectors Z1J2 and Z1J3.

NOTE: Terminology used in reference to Z1J2 and Z1J3 in the following paragraphs is wiring side and mating side of the connector. The wiring side of Z1J2 and Z1J3 is the side (or end) of the contact that is attached underneath sideboard Z1 (side opposite components). The mating side of Z1J2 and Z1J3 is the side (or end) of the contact that protrudes above the component side of sideboard Z1.

(1) Removal.

NOTE: Replacement of Z1J2 and Z1J3 contacts will not usually be required. Replacement will be required if a contact is broken. Bent contacts can usually be straightened, and straightening of a contact should be tried before replacement procedures are accomplished.

(a) Ensure that pin removal and insertion tools (D) listed in figure 1002 and shown in figure 1008 are available. These tools must be used to prevent damage to the contact mounting pads on the underneath or wiring side of the circuit board.

(b) Refer to the contact extraction portion of figure 403. Using small diagonal cutters or end nippers, snip off mating side of contact approximately 1/8 inch above surface on component side of sideboard Z1.

(c) With a small brush, sparingly apply solvent on both sides of circuit board at junction of contact and circuit board.

(d) Apply soldering iron with a small amount of flux on tip to junction of circuit board and mating side (cut off side) of contact. When solder melts, apply and actuate solder sucker to remove as much solder as possible.

(e) Position circuit board with component side down. Apply soldering iron to junction of circuit board and wiring side of contact. When solder melts, apply and actuate solder sucker to remove as much solder as possible.

(f) Repeat paragraphs (d) and (e) until no more solder is removed. Note position of shoulder on contact. New contact will be inserted with shoulder positioned the same as contact being removed.

CAUTION: ALLOW CIRCUIT BOARD TO COOL BETWEEN APPLICATION OF SOLDERING IRON.

(g) With circuit board positioned so that components face downward, raise up circuit board and carefully place backup tool (Ⓓ, figure 1002) over cutoff contact on mating side of contact. Ensure that slot in backup tool is aligned with long portion of contact shoulder as shown in figure 403.

NOTE: During the next step, the circuit board should be in a horizontal position, component side down, and resting on and supported entirely by the backup tool. Take care to ensure that the component side of the circuit board that is in contact with the backup tool is parallel to the backup tool surface. The circuit board must not tilt to one side or the other. Failure to ensure that parallel contact is not maintained can result in damage to the mounting pads (for Z1J2 and Z1J3 contacts) on the component side of the circuit board.

(h) Using impact tool (Ⓓ, figure 1002) and small lightweight hammer, place small tip of impact tool on base of contact at wiring side of contact (figure 403). Lightly tap impact tool several times. Contact should drop into slot of backup tool.

(i) Remove impact tool and backup tool, and with a small brush and solvent, again clean both sides of circuit board and hole from which contact was removed.

(2) Replacement.

(a) Refer to the contact insertion portion of figure 403. Carefully measure an existing contact in Z1J2 and Z1J3 and cut new contact (Collins part number 372-2236-010 or AMP Inc. part number 85932-1) to length. Prepare mating end as shown in figure 403.

NOTE: Insertion tool (D) listed in figure 1002 and shown in figure 1008 should be used for replacing contacts. The insertion tool has a square hole to keep the contact aligned during insertion. Also, the depth of the slot in the insertion tool is such that the new contact will be inserted exactly, the correct depth into the circuit board hole. The slot also ensures that the shoulder of the new contact will be aligned with the remaining contacts (as observed during contact extraction).

(b) Insert prepared contact into insertion tool as shown in figure 403, and tilting circuit board, lightly insert wiring side of contact into proper circuit board hole from the component side of circuit board.

(c) Position backup tool under proper circuit board hole on wiring side of circuit board. Ensure that slot of backup tool is aligned in the direction that shoulder of new contact will be in.

(d) Lift circuit board so that wiring side of circuit board (especially circuit board mounting pad and hole for new contact) is resting solidly on backup tool.

(e) Final check position of shoulder on new contact to ensure that it is the same as shoulder position on contact that was removed.

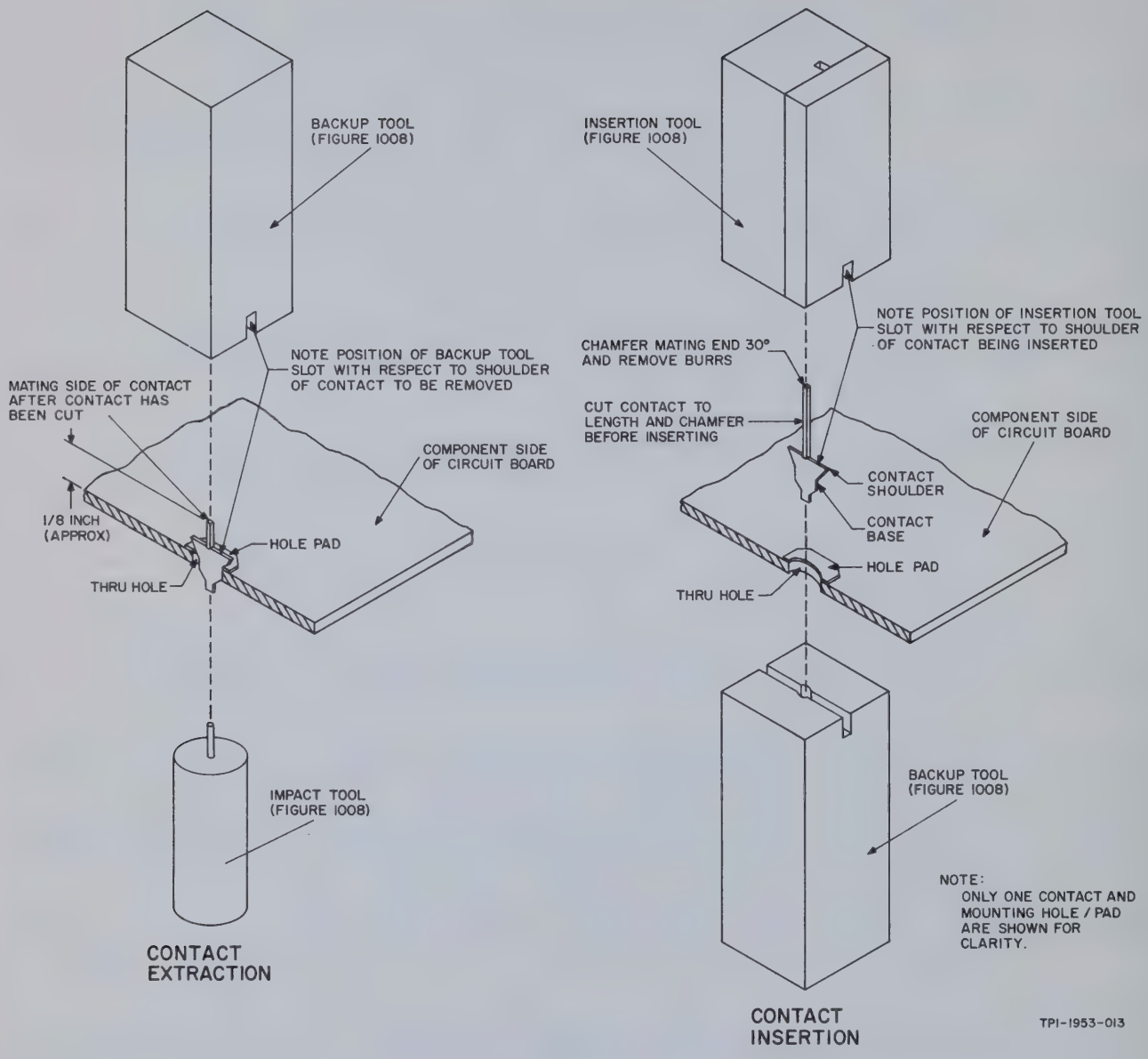
(f) Tap insertion tool with a small lightweight hammer until insertion tool is touching component side of circuit board. Remove insertion and backup tools.

(g) Inspect position and vertical alignment of contact with respect to existing contacts. Also check shoulder position. If contact is not vertical, carefully straighten using two fingers. If shoulder is not properly aligned (per removed contact), position insertion tool over contact and engage contact shoulder in tool slot. Carefully apply light clockwise or counterclockwise pressure as required to properly align shoulder. Remove insertion tool.

(h) Use flux and solder sparingly and solder contact into hole in circuit board. Solder should completely fill hole, and just cover upper edge of contact shoulder.

(i) Use a small brush or end of pipe cleaner and solvent to scrub new solder joint on both sides of circuit board.

(j) Apply protective coating to circuit board (not to mating portion of contact); solder joints per paragraph 3. D.


BACKUP TOOL (FIGURE 1008)
NOTE POSITION OF BACKUP TOOL SLOT WITH RESPECT TO SHOULDER OF CONTACT TO BE REMOVED
MATING SIDE OF CONTACT AFTER CONTACT HAS BEEN CUT
COMPONENT SIDE OF CIRCUIT BOARD
1/8 INCH (APPROX)
HOLE PAD
THRU HOLE
IMPACT TOOL (FIGURE 1008)
CONTACT EXTRACTION
INSERTION TOOL (FIGURE 1008)
NOTE POSITION OF INSERTION TOOL SLOT WITH RESPECT TO SHOULDER OF CONTACT BEING INSERTED
CHAMFER MATING END 30° AND REMOVE BURRS
CUT CONTACT TO LENGTH AND CHAMFER BEFORE INSERTING
COMPONENT SIDE OF CIRCUIT BOARD
CONTACT SHOULDER
CONTACT BASE
HOLE PAD
THRU HOLE
BACKUP TOOL (FIGURE 1008)
NOTE:
ONLY ONE CONTACT AND MOUNTING HOLE / PAD ARE SHOWN FOR CLARITY.
CONTACT INSERTION
TPI-1953-013

Z1J2 and Z1J3 Contact Extraction/Insertion Diagram
Figure 403

G. Replacement of Contacts (Receptacles) in Audio Test Generator and Timer Connectors Z2P2 and Z2P3.

NOTE: Terminology used in reference to Z2P2 and Z2P3 in the following paragraphs is wiring side and mating side of the connector. The wiring side of Z2P2 and Z2P3 is the side of the contact that is visible when looking at the component side of circuit board Z2. The mating side of Z2P3 and Z2P4 is the side that

is visible when viewing the backside of circuit board Z2. The mating side of Z2P3 and Z2P4 also has the blue-line connector housing protruding from the back side of circuit board Z2.

(1) Removal.

(a) Position circuit board Z2 on work surface with component side of board (wiring side of Z2P2 and Z2P3) facing upward.

(b) With a small brush, sparingly apply solvent on wiring side of contact being removed.

(c) Apply soldering iron with a small amount of flux to contact mounting pad on component side of circuit board. When solder melts, apply and actuate solder sucker. Remove as much solder as possible. Once solder is removed, use a blunt probe (such as a soldering aid) and press wiring side of contact downward and out through blue-line connector housing.

NOTE: It may be necessary to slightly straighten the contact securing tabs (at wiring side of contact) prior to contact removal. After solder melts, use solder sucker and soldering aid point or small needle-nosed pliers and straighten securing tabs. Contact should now be pressed downward out of blue-line connector housing.

(d) Once contact is removed, reheat contact mounting pad (on component side of circuit board Z2) and apply and actuate solder sucker to remove any remaining solder. Check hole in blue-line connector housing for any solder and carefully remove with soldering aid if necessary.

(e) Use a small brush or end of pipe cleaner and solvent to scrub mounting pad on component side of circuit board Z2.

(2) Replacement.

(a) Position circuit board Z2 on work surface with back side of board (mating side of Z2P2 and Z2P3) facing upward.

(b) Do not cut long securing tabs at wiring side of new contact at this time. Observe placement of securing tabs on existing contacts and insert new contact (Collins part number 372-2252-010 or AMP Inc. part number 85964-1) into blue-line housing from back side of circuit board Z2. Ensure that securing tabs are positioned the same as existing tabs.

(c) Pressing from mating side, exert enough pressure to seat new contact in housing (check existing contact for a reference point).

(d) Position circuit board Z2 on work surface with component side of board (wiring side of Z2P2 and Z2P3) facing upward.

(e) Bend long securing tabs over, using fingers. When bent along side of mounting pad (again use existing contacts for reference), cut excess tab, using small diagonal cutters. Ensure that ends of remaining tab material lie flush with top surface of mounting pad.

(f) Use flux and solder sparingly and solder contact to mounting pad (at wiring side of contact).

CAUTION: DO NOT USE EXCESSIVE SOLDER. EXCESS SOLDER COULD FLOW DOWNWARD INTO CONTACT.

(g) Use a small brush or end of pipe cleaner and solvent to scrub new solder joint on wiring side of contact.

(h) Apply protective coating to mounting pad (do not let coating flow into contact) per paragraph 3. D.

1051B-1 VHF NAV Receiver Planar Assembly - Assembly

1. GENERAL.

This section presents instructions for assembling the 1051B-1 VHF NAV Receiver Planar Assembly.

2. PRECAUTIONS AND GENERAL TECHNIQUES.

Before soldering any part, refer to the notes of color coding, placement of leads, and wire insulation made during disassembly.

CAUTION: WHEN REPLACING A SOLID-STATE DEVICE, USE A HEAT SINK ON THE LEADS TO PREVENT DAMAGE TO THE SEMICONDUCTOR.

3. REPLACEMENT OF CARDS AND COVERS ON SIDEBOARD. (Refer to figure 4.)

A. Cover Replacement.

Replace covers on shielded compartments by replacing screws securing covers to compartments.

B. Audio Test Generator and Timer Z2.

Carefully align card Z2 so pins on planar side board Z1 match up with respective jacks located on card Z2. Carefully press card straight down as far as it will go. Replace 10 screws to secure card Z2 to sideboard Z1.

NOTE: Refer to the 51RV-2B VOR/ILS Receiver Overhaul Manual (523-0760757) assembly section for procedures to install the 1051B-1 VHF NAV Receiver in the 51RV-2B.

1051B-1 VHF NAV Receiver Planar Assembly - Fits and Clearances

(Not Applicable)

1051B-1 VHF NAV Receiver Planar Assembly - Testing

1. GENERAL.

This section presents the procedures for bench testing the 1051B-1 VHF NAV Receiver. A suspect or faulty 1051B-1 VHF NAV Receiver should first be subjected to the trouble-shooting procedures. Results obtained from the test procedures will enable the technician to determine if maintenance is necessary.

2. TEST EQUIPMENT AND POWER REQUIREMENTS.

A. Test Equipment.

Refer to the special tools, fixtures, and equipment section of this manual for test equipment required to test the 1051B-1 VHF NAV Receiver.

CAUTION: ENSURE THAT ALL TEST EQUIPMENT IS PROPERLY CALIBRATED BEFORE BEGINNING ANY TEST. PARAGRAPH 4 IN THIS SECTION PROVIDES PROCEDURES TO ENSURE THAT THE CORRECT PERCENTAGES OF MODULATION ARE PROVIDED BY THE 211-A AND 479 479S-3 SIGNAL GENERATORS.

B. Power Sources.

A +27.5-volt dc ±2 percent power source that is variable from +21 volts to +31 volts, and a 115-volt ±10 percent 60-Hz power source are required to test the 1051B-1 VHF NAV Receiver.

3. DEFINITION OF STANDARD TEST SIGNALS.

A. General.

The following paragraphs provide definitions for the standard test signals used to test the 1051B-1.

NOTE: All of the standard VOR and localizer test signals are provided by the Collins 479S-3 Audio Signal Generator modulating a Boonton 211-A Signal Generator. Refer to paragraph 4 in this section for recommended setup procedures for the signal generators.

B. Input Levels.

Unless otherwise specified, all rf input levels refer to the voltage at the input to a 6-db, 50-ohm pad connected between the signal generator and the test jig VOR/LOC ANT jack, or the 977A-1 Test Panel VHF IN jack.

C. Standard VOR Test Signals.

(1) VOR Test Signal.

An rf carrier, at an output level of 1000 microvolts, is amplitude modulated simultaneously with a 30-percent, 9960-Hz subcarrier and a 30-percent, 30-Hz variable phase signal. The 9960-Hz subcarrier is frequency modulated at a deviation ratio of 16 by a 30-Hz reference phase signal. The phase of the variable signal can be varied with respect to the reference phase signal.

(2) VOR Audio Test Signal.

A standard VOR audio test signal consists of the VOR test signal described above to which is added a 1000-Hz signal amplitude modulated 30 percent.

(3) Audio Test Signal.

An rf carrier is amplitude modulated 30 percent by a 1000-Hz signal.

D. Standard Localizer Test Signal.

(1) Localizer Test Signal.

An rf carrier, at an input level of 1000 microvolts, is amplitude modulated simultaneously with a 90-Hz ±0.3 percent and a 150-Hz ±0.3 percent signal, so that the separate modulation percentages are equal, and their sum equals 40 ±2.0 percent. (When each signal is applied separately, the carrier is modulated 20 ±2 percent.)

NOTE: A correct indication on the 211-A PERCENT MODULATION meter will be approximately 32 percent when both the 90- and 150-Hz signals are correctly adjusted and a standard localizer centering signal is being used. Refer to paragraph 4.B.

(2) Localizer Centering Signal.

A standard localizer centering signal consists of the localizer test signal (paragraph 3.D.(1)) where the difference in depth of modulation of the 90 and 150 Hz is less than 0.002 volt (0.1 db). (0 db on 479S-3 TONE LOCALIZER switch.)

(3) Localizer Deviation Signal.

A standard localizer deviation signal consists of the localizer test signal (paragraph 3.D.(1)) where the difference in depth of modulation of the 90 and 150 Hz is 0.093 ±0.002 volt (4.0 ±0.1 db) (either of the 4 DB positions of 479S-3 TONE LOCALIZER switch.)

NOTE: When the difference in depth of modulation of the 90 Hz is greater than the 150 Hz, a deflection to the right occurs. When the difference in depth of modulation of the 150 Hz is greater than the 90 Hz, a deflection to the left occurs.

(4) Localizer Audio Signal.

A standard localizer audio signal consists of the localizer test signal (paragraph 3. D. (1)) to which is added an audio signal amplitude modulating the rf carrier 30 percent.

4. TEST EQUIPMENT CALIBRATION.

A. General.

The following paragraphs provide procedures to ensure that the percent of modulation of the recommended signal generator (Boonton generator) is correct. Procedures are also provided for calibrating the VOR signal, and 90/150-Hz signals (for localizer) provided by the Collins 479S-3 Audio Signal Generator.

NOTE: Allow a minimum warmup time of 15 minutes before proceeding with the percent modulation calibration procedures.

B. Boonton 211-A Signal Generator Percent Modulation Calibration.

Ensure that the 211-A is properly calibrated and adjusted before proceeding.

NOTE: If 211-A already has modulation monitoring jacks installed, then disregard steps (1) and (2), and proceed directly to step (3).

(1) Refer to the 211-A instruction book and locate the negative terminal of the RF MONITOR meter. Install a black tip jack on the 211-A front panel (isolated from ground). Connect a wire from negative terminal of RF MONITOR meter to black tip jack.

(2) Refer to the 211-A instruction book and locate the arm of control P304. Install a red tip jack on the 211-A front panel (isolated from grount) adjacent to the black tip jack installed in step (1). Connect a wire from the arm of P304 to red tip jack.

(3) Parallel a dc and an ac (rms) vtvm across the negative (black) and positive (red) tip jacks, Ensure that each vtvm is calibrated. (An HP-410B may be used by switching between ac and dc as required.)

NOTE: Ensure that ac and dc meters are isolated from ground.

(4) Position 211-A OSC SEL switch to OFF. Electrically zero the dc vtvm using the 211-A RF MONITOR meter ADJ ZERO control.

(5) Electrically zero the 211-A PERCENT MODULATION meter using the adjacent ADJ ZERO control.

(6) Position the 211-A OSC SEL switch to MO. Observe dc vtvm and adjust 211-A RF LEVEL control for an indication of +26 volts dc (should correspond to red-line indication on RF MONITOR meter).

(7) Repeat steps (4), (5), and (6) until no further adjustments are necessary.

(8) Percentages of modulation and their corresponding ac rms voltages can now be obtained. For 20-percent modulation, observe ac vtvm and adjust 211-A MOD LEVEL control for an indication of 3.75 volts ac (rms). For 30-percent modulation, observe ac vtvm and adjust 211-A MOD LEVEL control for an indication of 5.62 volts ac (rms).

NOTE: Percentages of modulation other than 20 and 30 percent can be computed using 1 volt ac (rms) as equal to 5.38 percent of modulation (approximately linear throughout the 211-A modulation range).

C. Collins 479S-3 Audio Signal Generator Calibration.

(1) VOR Calibration.

(a) Position 479S-3 FUNCTION SELECTOR to CAL.

(b) Position SPECIFIC SIGNAL SELECTOR to 30~ VAR ϕ.

(c) Connect ac (rms) vtvm to 479S-3 MOD OUTPUT connector.

(d) Open 479S-3 potentiometer access door and adjust 30~ VAR ϕ control for an indication of 0.5 volt rms on vtvm. Lock potentiometer shaft.

(e) Position SPECIFIC SIGNAL SELECTOR to 9960 FM.

(f) Adjust 9960 FM control (behind potentiometer access door) for an indication of 0.5 volt rms on vtvm. Lock potentiometer shaft.

(g) Position FUNCTION SELECTOR to ODR. A standard VOR test signal is now available at the 479S-3 MOD OUTPUT connector.

(2) 90/150-Hz Localizer Tone Calibration.

(a) Position 479S-3 FUNCTION SELECTOR to CAL.

(b) Position SPECIFIC SIGNAL SELECTOR to 90 to 150~.

(c) Connect ac (rms) vtvm to 479S-3 MOD OUTPUT connector.

(d) Position 479S-3 TONE LOCALIZER control to CAL 90~.

(e) Open 479S-3 potentiometer access door and adjust 90 control for an indication of 0.33 volt rms on vtvm. Lock potentiometer shaft.

(f) Position 479S-3 TONE LOCALIZER control to CAL 150~.

(g) Adjust 150 control (behind potentiometer access door) for an indication of 0.33 volt rms. Lock potentiometer shaft.

(h) Position FUNCTION SELECTOR to TONE LOC. Position TONE LOCALIZER control to 0. A standard localizer centering signal is now avialable at the 479S-3 MOD OUTPUT connector.

5. TEST PROCEDURES.

A. Use of Test Procedures.

The test procedures for the 1051B-1 VHF NAV Receiver are presented in tabular form. Two separate procedures are given. Procedure 1 uses standard test equipment plus a fabricated test jig, test connector adapter unit, and planar assembly extender cable. Procedure 2 uses standard test equipment with the Collins 977A-1 Test Panel.

Directions for using the tabular test procedures follow:

(1) The 1051B-1 should be completely assembled, and all covers should be in place before proceeding with the test.

(2) When any block associated with a test equipment setting is empty, all pertinent controls have been set in a previous step and do not have to be changed.

(3) All related test setup diagrams and tables of initial test equipment control settings are shown before the test procedure. These diagrams and tables are discussed in paragraphs 5.B.(1) and 5.B.(2).

(4) Functions of the various columns on the test procedure are as follows:

(a) The TEST column gives the sequential test number, and the name of the test being performed.

(b) The TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2 columns provide instructions pertaining to switch or control settings for the 211-A and 479S-3 signal generators. Only the switch or control mentioned in a column for a given test need be changed or adjusted. All other switches or controls have been properly positioned or adjusted and do not have to be changed.

(c) The PROCEDURE 1 USING STANDARD TEST EQUIPMENT columns provide instructions for testing the 1051B-1 using the customer-fabricated test jig, test connector adapter unit, and extender cable. An external control unit, such as the Collins 313N-( ) is also required. The PROCEDURE column provides instructions required to perform a given test. The OUTPUT column provides test point, test equipment, test limits, and other end result indications.

(d) The PROCEDURE 2 USING 977A-1 TEST PANEL columns provide instructions for testing the 1051B-1 using the Collins 977A-1 Test Panel. The FREQUENCY column shows the required frequency (frequency controls provided by 977A-1). The PROCEDURE column provides instructions required to perform a given test. The OUTPUT columns list the various outputs from the 977A-1 (DC VOLTAGE, AC VOLTS, and CRO) and also provide output test point locations on the 977A-1, test equipment used to measure the output, and test limits or other end result indications.

NOTE: When a switch position is shown under the DC VOLTAGE, AC VOLTS or CRO columns, it is the responsibility of the test technician to ensure that the appropriate 977A-1 switches are adjusted to select the specified parameter.

(e) The COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2 column is used for notes and/or supplemental information pertaining to a given test. The information in this column is common to either procedure 1 or procedure 2. The COMMENTS column will, when applicable, provide instructions to proceed to the procedures of figure 705 (rf stage alignment).

(5) Performing a complete test requires that all steps of the procedure be completed in the order shown.

(6) It will be possible to isolate many problems directly from performing the test procedures. Refer to the troubleshooting section of this manual for further information concerning location of trouble.

NOTE: Before proceeding with the 1051B-1 VHF NAV Receiver Planar Assembly test procedures, ensure that the 680T-1 VHF Synthesizer Planar Assembly meets the test requirements as specified in the testing section of the 680T-1 VHF Synthesizer Planar Assembly Overhaul Manual.

(7) The following abbreviations are used in the test procedure:

ABBREVIATION	DEFINITION
db	Decibel(s)
Hz	Hertz
kHz	Kilohertz
ma	Milliampere(s)
MHz	Megahertz
mv	Millivolt(s)
rms	Root mean square
rf	Radio frequency
ua	Microampere(s)
uv	Microvolt(s)
vac	Volts ac
vdc	Volts dc
NA	Not applicable

B. Test Procedures.

(1) Test Setup.

Test setup diagrams are shown in figures 701 and 702. Figure 701 is the test setup for testing the 1051B-1 using standard test equipment. The test equipment shown in figure 701 is specified in figure 1001 of the special tools, fixtures, and equipment section. Fabricate the 51RV-2B test jig, extender cable, and test connector adapter unit as called out in figure 1001.

Figure 702 is the test setup for testing the 1051B-1 using the 977A-1 Test Panel. Figure 1001 specifies the test equipment shown in figure 702.

Ensure that all test equipment is properly calibrated before beginning any test (refer to paragraph 4 in this section).

Instructions for connecting the test jig, extender cable, test connector adapter unit, or the 977A-1 to the 1051B-1 are contained in the test procedures.

(2) Equipment Setup.

Figure 703 is a table of initial test equipment control settings. All controls or switches on the applicable test equipment should be positioned as specified in figure before beginning the test procedures. If the position of any control or switch is not specified for any piece of test equipment, that setting is not relevant to the test procedure.

NOTE: Allow 15 minutes warmup time for all test equipment.

(3) Procedures.

The test procedures for the 1051B-1 VHF NAV Receiver Planar Assembly are presented in two figures. Figure 704 provides the procedures for testing and adjusting all portions of the 1051B-1 VHF NAV Receiver except for the rf stages. Figure 705 provides the complete alignment procedures for the rf stages. References to performing the procedures of figure 705 are made in various steps of figure 704 and in the troubleshooting section. Figure 706 provides procedures for testing the audio test generator and timer card (part of the 1051B-1) using the 977A-1 Test Panel and the 977C-1 Test Unit.

CAUTION: DO NOT PERFORM THE PROCEDURES SHOWN IN FIGURE 705 AS A PART OF ROUTINE TESTING. THE PROCEDURES OF FIGURE 705 SHOULD BE PERFORMED ONLY WHEN DIRECTED TO DO SO.

The test procedures should be accomplished by referring to figure 703 and ensuring that the test equipment controls and switches are positioned as shown. After completion of figure 703, proceed to figure 704 (test procedures) and begin with test number 0.1.

NOTE: The test procedures and alignment procedures are contained on foldout pages. However, test equipment control and switch settings from a previous page (test) are NOT repeated at the beginning of each new page. For many of the tests, adjustments and results of previous tests will affect the adjustments and results of following tests. It is therefore recommended that the complete test procedure (figure 704) be accomplished beginning with test 0.1. By performing the complete test procedure, all test equipment control and switch settings are given as they are required, and do not have to be changed unless instructions to do so are shown in following tests. An index of the test numbers and names is given in the following paragraph. If it is desired to perform only a given test (without performing all of the procedures up to the desired

test) then the technician should scan the TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2 columns beginning with test 0.1, and adjust the test equipment as shown in following tests until the desired test is reached. The frequency setting of the 313N-( ) control or 977A-1 FREQUENCY switches should also be checked to ensure that the last frequency used for a previous test is selected.

The test procedure and alignment procedure index is as follows:

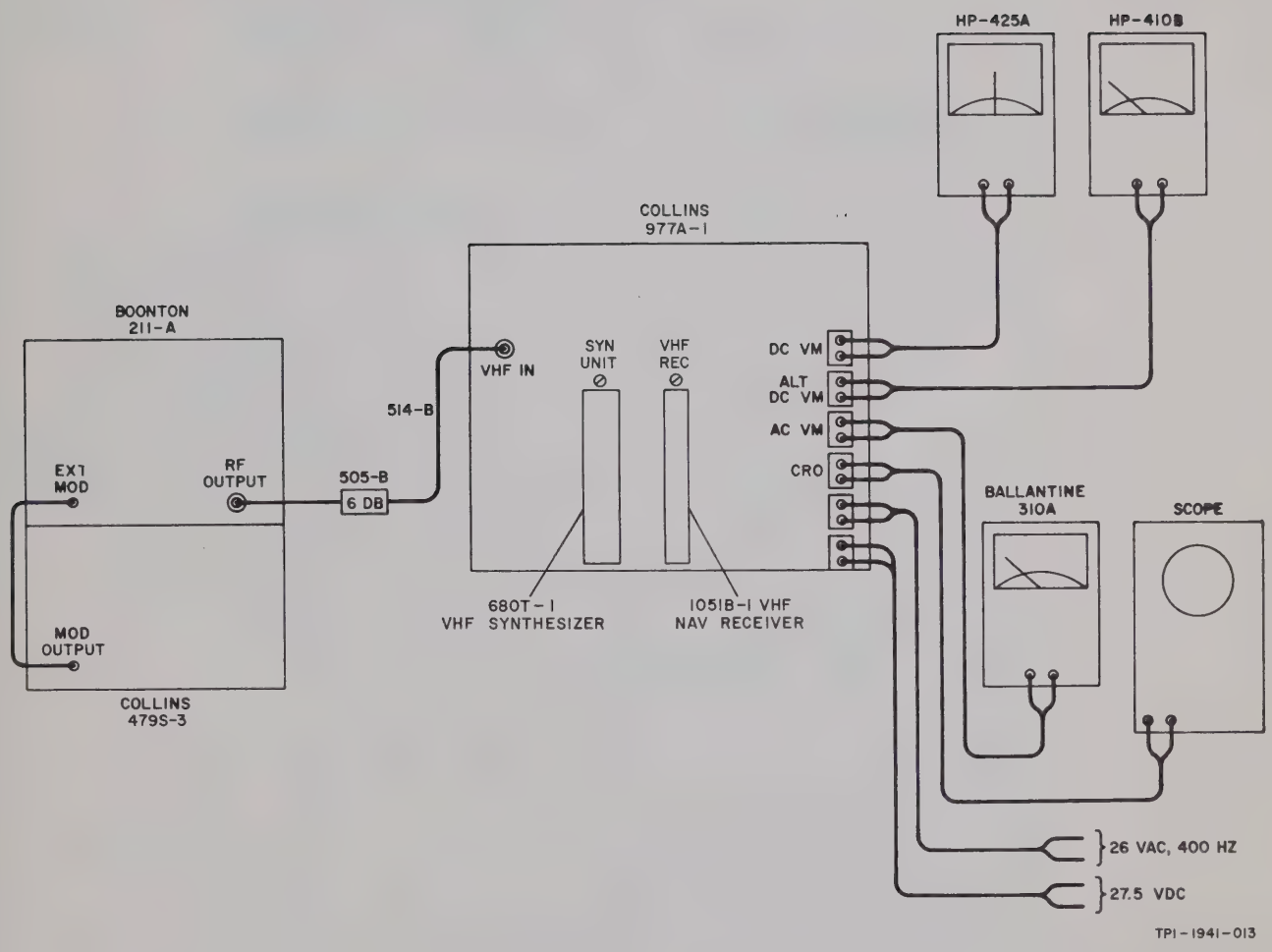
	TEST NUMBER	TEST NAME
Figure 704, Test Procedures	0.1	Test setup
	1.0	+18/+5-vdc power supply adjust
	2.0	Sensitivity test
	3.0	Receiver quieting
	4.0	Selectivity
	5.0	Detector and audio output
	6.0	Agc characteristics
	7.0	Detector audio frequency response
	8.0	VOR/LOC mode relay
	9.0	Input power
	10.0	Audio test generator and timer adjustment procedures
	11.0	End-of-test procedures
Figure 705, Alignment Procedures	0.1	Preliminary
	1.0	18-MHz if. alignment
	2.0	Vhf tuner and first mixer alignment

6. AUDIO TEST GENERATOR AND TIMER WIRING OPTIONS.

A. General.

Four wiring options can be performed on the audio test generator and timer card, Z2. As supplied from the factory, none of the wiring options are completed. The wiring options are to be performed in the customer's shop, and the basis for completing any wiring option is determined by the customer's needs.

The four wiring options modify the normal operation of the audio test generator and timer as described in the description and operation section, paragraph 5.C.(5). The first wiring option allows the VOR/LOC and/or GS flag(s) to remain in view throughout the complete test cycle. The second option allows the VOR/LOC and/or GS flag(s) to remain out of view during the test if there are no faults in the 1051B-1 VHF NAV Receiver. The third option allows the 3-second timer to be disabled. The fourth option allows the VOR/LOC and/or GS flag(s) to come into view for 3 seconds and then remain out of view during the test if there are no faults in the 1051B-1 VHF NAV Receiver (the flag will remain out of view as long as the self-test switch is actuated).



1051B-1 VHF NAV Receiver Planar Assembly, Test Setup
Using 977A-1 Test Panel
Figure 702

TEST EQUIPMENT	CONTROL OR JACK	SETTING OR POSITION	COMMENTS
Boonton 211-A VHF Signal Generator	RF OUTPUT jack	Connect to test jig J4 for procedure 1. Connect to 977A-1 VHF IN for procedure 2.	Connect through a 6-db, 50-ohm pad.
	POWER switch	ON	
	OSC SEL switch	MO	
	FREQUENCY control	108.00 MC	Adjust FREQUENCY control around 108.00 MHz and check frequency with frequency counter at 211-A RF OUTPUT jack.
	MOD RANGE switch	100%	
	OUTPUT LEVEL control	1000 uv	
	RF LEVEL control RF MONITOR meter ADJ ZERO control MOD LEVEL control PERCENT MODULATION meter	Per paragraph 4.B.	
	MOD switch	1000~	
	XTAL switch	114.9	
	EXT MOD jack	Connect to 479S-3 MOD OUTPUT jack.	
Collins 479S-3 Audio Signal Generator	POWER switch	ON	
	NOTE: Perform procedures of paragraph 4.C. before adjusting the following controls.		

Test Equipment Initial Control/Switch Settings (Sheet 1 of 2)
Figure 703

TEST EQUIPMENT	CONTROL OF JACK	SETTING OR POSITION	COMMENTS
Collins 479S-3 Audio Signal Generator (Cont)	TONE LOCALIZER switch	4DB (to the right)	
	PHASE ANGLE SELECTOR control	0 degree	
	FUNCTION SELECTOR switch	SPECIFIC SIGNAL	
	SPECIFIC SIGNAL SELECTOR switch	30~ VAR ϕ	
	1000~ switch	OFF	
	MOD OUTPUT jack	Connect to 211-A EXT MOD jack.	
Collins 479V-3 Precision Track Selector	400 CPS/30 CPS switch	400 CPS	
	BEARING DEGREES switch	180 degrees	

Test Equipment Initial Control/Switch Settings (Sheet 2 of 2)
Figure 703

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT				
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT		
						TEST POINT	TEST EQUIPMENT	RESULT
0.1	Test setup	Per figure 703. NOTE: Leave all controls/switches set per figure 703 until instructed to change any control/ switch setting.	Per figure 703. NOTE: Leave all controls/switches set per figure 703 until instructed to change any control/ switch setting.	108.00 MHz	NOTE: The vhf NAV receiver should be removed from the 51RV-2B interconnect unit before proceeding. Refer to the disassembly section. Use test setup shown in figure 701. Connect J1 of 51RV-2B test jig (figure 1003) to 51RV-2B Interconnect Unit rear connector P1. Refer to figure 1004 in the special tools, fixtures, and test equipment section and fabricate the vhf NAV receiver extender cable. Connect P1 of extender cable to 51RV-2B Interconnect Unit connector J2 (vhf NAV receiver connector on interconnect unit). Connect J1 of extender cable to 1051B-1 VHF NAV Receiver rear connector P1. Refer to figure 1005 and fabricate the test connector adapter unit. Connect J2 of test connector adapter unit to 51RV-2B Interconnect Unit rear connector P2. Ensure that the remaining planar assemblies connected to the 51RV-2B Interconnect Unit are insulated from each other. Insulate the 1051B-1 VHF NAV Receiver from the workbench with a piece of cork or rubber (see caution in COMMENTS column). Position test jig switches as follows: S1 to X1, S2 to X1, and S3 to LOAD. Connect +27.5 vdc and 26 vac, 400-Hz power to 51RV-2B test jig (power switch on 313N-( ) control OFF).			
1.0	+18/+5 vdc power supply adjust				Ensure that variable output regulated power supply is adjusted to +27.5 vdc. Position 313N-( ) control unit power switch to PWR.			
1.1					Refer to figures 801 and 802 and locate Z6TP1 (cover on power supply can be removed or Z6TP1 can be located on backside of vhf NAV receiver sideboard. On some units, Z6TP1 is silk-screened on backside of sideboard). Observe meter.	Z6TP1 and ground	Fluke 801B (adjust for dc operation)	+20.2 vdc.
1.2					Observe meter.	18V terminal on power supply Z6 and ground	Fluke 801B	+18.0 vdc.
1.3					Adjust variable output power supply (connected to test jig +27.5-vdc jacks) to +21.0 vdc and observe meter.	18V terminal on power supply Z6 and ground	Fluke 801B	+18.0 ±0.5 vdc.
1.4					Adjust variable output power supply to +31.0 vdc and observe meter. Adjust variable output power supply to +27.5 vdc.	18V terminal on power supply Z6 and ground	Fluke 801B	+18.0 ±0.5 vdc.
1.5					Observe meter.	5V terminal on power supply Z6 and ground	Fluke 801B	+5.0 ±0.25 vdc.

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 1 of 6)
Figure 704

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
						OUTPUT					OUTPUT						
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	TEST POINT	TEST EQUIPMENT	RESULT	FREQUENCY	PROCEDURE	DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
0.1	Test setup	Per figure 703. NOTE: Leave all controls/switches set per figure 703 until instructed to change any control/ switch setting.	Per figure 703. NOTE: Leave all controls/switches set per figure 703 until instructed to change any control/ switch setting.	108.00 MHz	NOTE: The vhf NAV receiver should be removed from the 51RV-2B interconnect unit before proceeding. Refer to the disassembly section. Use test setup shown in figure 701. Connect J1 of 51RV-2B test jig (figure 1003) to 51RV-2B Interconnect Unit rear connector P1. Refer to figure 1004 in the special tools, fixtures, and test equipment section and fabricate the vhf NAV receiver extender cable. Connect P1 of extender cable to 51RV-2B Interconnect Unit connector J2 (vhf NAV receiver connector on interconnect unit). Connect J1 of extender cable to 1051B-1 VHF NAV Receiver rear connector P1. Refer to figure 1005 and fabricate the test connector adapter unit. Connect J2 of test connector adapter unit to 51RV-2B Interconnect Unit rear connector P2. Ensure that the remaining planar assemblies connected to the 51RV-2B Interconnect Unit are insulated from each other. Insulate the 1051B-1 VHF NAV Receiver from the workbench with a piece of cork or rubber (see caution in COMMENTS column). Position test jig switches as follows: S1 to X1, S2 to X1, and S3 to LOAD. Connect +27.5 vdc and 26 vac, 400-Hz power to 51RV-2B test jig (power switch on 313N-( ) control OFF).				108.00 MHz	Use test setup shown in figure 702. Connect 1051B-1 VHF NAV Receiver to VHF REC connector on 977A-1. Connect a 680T-1 VHF Synthesizer to SYN UNIT connector on 977A-1. Position 977A-1 switches as follows: MODE switch to VOR, 900~ and NAV DISABLE to off (down), VOR, UP-LT, and DN-RT SELF TEST to off (down), DEVIATION ALARM TEST to OFF, and AC and DC INPUT POWER switches off (down). Connect +27.5 vdc and 26 vac 400-Hz power to 977A-1. Loosen single Dzus fastener above VHF REC connector and lift connector and vhf NAV receiver up and away from 977A-1 front panel. This allows the vhf NAV receiver to be moved around for easy access to components during testing and alignment (see caution in COMMENTS column).							CAUTION: DO NOT PLACE 1051B-1 VHF NAV RECEIVER DIRECTLY ON METAL WORKBENCH. ADEQUATE INSULATION MUST BE USED BETWEEN WORKBENCH AND PLANAR ASSEMBLY TO PREVENT THE 1051B-1 COMPONENTS FROM SHORTING.
1.0	+18/+5 vdc power supply adjust				Ensure that variable output regulated power supply is adjusted to +27.5 vdc. Position 313N-( ) control unit power switch to PWR.					Ensure that variable output regulated power supply is adjusted to +27.5 vdc. Position 977A-1 DC INPUT POWER switch on (up).							
1.1					Refer to figures 801 and 802 and locate Z6TP1 (cover on power supply can be removed or Z6TP1 can be located on backside of vhf NAV receiver sideboard. On some units, Z6TP1 is silk-screened on backside of sideboard). Observe meter.	Z6TP1 and ground	Fluke 801B (adjust for dc operation)	+20.2 vdc.		Refer to figures 801 and 802 and locate Z6TP1 (cover on power supply can be removed or Z6TP1 can be located on backside of vhf NAV receiver sideboard. On some units, Z6TP1 is silk-screened on backside of sideboard). Observe meter.				Z6TP1 and ground	Fluke 801B (adjust for dc operation)	+20.2 vdc.	If necessary, adjust 20.2 V control Z6R14 (figure 802) until result is obtained.
1.2					Observe meter.	18V terminal on power supply Z6 and ground	Fluke 801B	+18.0 vdc.		Observe meter.	UNIT 18V			DC VM	Fluke 801B	+18.0 vdc.	If necessary, adjust 18.0 V control Z6R29 (figure 802) until result is obtained.
1.3					Adjust variable output power supply (connected to test jig +27.5-vdc jacks) to +21.0 vdc and observe meter.	18V terminal on power supply Z6 and ground	Fluke 801B	+18.0 ±0.5 vdc.		Adjust variable output power supply (connected to 977A-1 27.5 vdc jacks) to +21.0 vdc and observe meter.	UNIT 18V			DC VM	Fluke 801B	+18.0 ±0.5 vdc.	
1.4					Adjust variable output power supply to +31.0 vdc and observe meter. Adjust variable output power supply to +27.5 vdc.	18V terminal on power supply Z6 and ground	Fluke 801B	+18.0 ±0.5 vdc.		Adjust variable output power supply to +31.0 vdc and observe meter. Adjust variable output power supply to +27.5 vdc.	UNIT 18V			DC VM	Fluke 801B	+18.0 ±0.5 vdc.	Tests 1.3 and 1.4 check the operation of the voltage regulator in the 1051B-1 VHF NAV Receiver.
1.5					Observe meter.	5V terminal on power supply Z6 and ground	Fluke 801B	+5.0 ±0.25 vdc.		Observe meter.	UNIT 5V			DC VM	Fluke 801B	+5.0 ±0.25 vdc.	

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 1 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
108.00 MHz	Use test setup shown in figure 702. Connect 1051B-1 VHF NAV Receiver to VHF REC connector on 977A-1. Connect a 680T-1 VHF Synthesizer to SYN UNIT connector on 977A-1. Position 977A-1 switches as follows: MODE switch to VOR, 900~ and NAV DISABLE to off (down), VOR, UP-LT, and DN-RT SELF TEST to off (down), DEVIATION ALARM TEST to OFF, and AC and DC INPUT POWER switches off (down). Connect +27.5 vdc and 26 vac 400-Hz power to 977A-1. Loosen single Dzus fastener above VHF REC connector and lift connector and vhf NAV receiver up and away from 977A-1 front panel. This allows the vhf NAV receiver to be moved around for easy access to components during testing and alignment (see caution in COMMENTS column).							CAUTION: DO NOT PLACE 1051B-1 VHF NAV RECEIVER DIRECTLY ON METAL WORKBENCH. ADEQUATE INSULATION MUST BE USED BETWEEN WORKBENCH AND PLANAR ASSEMBLY TO PREVENT THE 1051B-1 COMPONENTS FROM SHORTING.
	Ensure that variable output regulated power supply is adjusted to +27.5 vdc. Position 977A-1 DC INPUT POWER switch on (up).							
	Refer to figures 801 and 802 and locate Z6TP1 (cover on power supply can be removed or Z6TP1 can be located on backside of vhf NAV receiver sideboard. On some units, Z6TP1 is silkscreened on backside of sideboard). Observe meter.				Z6TP1 and ground	Fluke 801B (adjust for dc operation)	+20.2 vdc.	If necessary, adjust 20.2 V control Z6R14 (figure 802) until result is obtained.
	Observe meter.	UNIT 18V			DC VM	Fluke 801B	+18.0 vdc.	If necessary, adjust 18.0 V control Z6R29 (figure 802) until result is obtained.
	Adjust variable output power supply (connected to 977A-1 27.5 vdc jacks) to +21.0 vdc and observe meter.	UNIT 18V			DC VM	Fluke 801B	+18.0 ±0.5 vdc.	
	Adjust variable output power supply to +31.0 vdc and observe meter. Adjust variable output power supply to +27.5 vdc.	UNIT 18V			DC VM	Fluke 801B	+18.0 ±0.5 vdc.	Tests 1.3 and 1.4 check the operation of the voltage regulator in the 1051B-1 VHF NAV Receiver.
	Observe meter.	UNIT 5V			DC VM	Fluke 801B	+5.0 ±0.25 vdc.	

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT				
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT		
						TEST POINT	TEST EQUIPMENT	RESULT
2.0	Sensitivity Test							
2.1		Ensure that 211-A is adjusted to 108.00 MHz (check with frequency counter such as HP-524D or 5245L). Adjust OUTPUT LEVEL control to 3uv.			Observe meter and record db indication (see mote in COMMENTS column).	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.
2.2		Disconnect 479S-3 from 211-A EXT MOD jack. Position 211-A MOD switch to EXT.			Observe meter and record db indication.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.
2.3					Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1.			Not less than 6 db.
3.0	Receiver quieting							
3.1		Do not reconnect 479S-3 to 211-A at this time. Adjust OUTPUT LEVEL control to 100 uv. Position OSC SEL to XTAL and adjust FREQUENCY control around 114.90 MHz for maximum indication on RF MONITOR meter. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Position MOD switch to 1000~ and check for 30-percent modulation.		114.90 MHz	Observe meter and record db indication.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.
3.2		Position 211-A MOD switch to EXT.			Observe meter and record db indication.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.
3.3					Subtract db indication obtained in test 3.2 from db indication obtained in test 3.1.			Not less than 30 db.
4.0	Selectivity	Position OSC SEL switch to MO.			NOTE: An HP-608D Signal Generator can also be used throughout test 4.0.			
4.1		Position 211-A MOD switch to 1000~ Adjust OUTPUT LEVEL control to 4 uv. Check for red-line indication on RF MONITOR meter and check for 30-percent modulation (adjust if necessary).			Observe meter and record indication.	Test connector adapter unit J10 and ground	HP-410B	Recorded.
4.2		Adjust OUTPUT LEVEL control to 8 uv. Adjust FREQUENCY control per procedure.			Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	Test connector adapter unit J10 and ground FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or more than 114.9225 MHz).

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 2 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
108.00 MHz	Use test setup shown in figure 702. Connect 1051B-1 VHF NAV Receiver to VHF REC connector on 977A-1. Connect a 680T-1 VHF Synthesizer to SYN UNIT connector on 977A-1. Position 977A-1 switches as follows: MODE switch to VOR, 900~ and NAV DISABLE to off (down), VOR, UP-LT, and DN-RT SELF TEST to off (down), DEVIATION ALARM TEST to OFF, and AC and DC INPUT POWER switches off (down). Connect +27.5 vdc and 26 vac 400-Hz power to 977A-1. Loosen single Dzus fastener above VHF REC connector and lift connector and vhf NAV receiver up and away from 977A-1 front panel. This allows the vhf NAV receiver to be moved around for easy access to components during testing and alignment (see caution in COMMENTS column).							CAUTION: DO NOT PLACE 1051B-1 VHF NAV RECEIVER DIRECTLY ON METAL WORKBENCH. ADEQUATE INSULATION MUST BE USED BETWEEN WORKBENCH AND PLANAR ASSEMBLY TO PREVENT THE 1051B-1 COMPONENTS FROM SHORTING.
	Ensure that variable output regulated power supply is adjusted to +27.5 vdc. Position 977A-1 DC INPUT POWER switch on (up).							
	Refer to figures 801 and 802 and locate Z6TP1 (cover on power supply can be removed or Z6TP1 can be located on backside of vhf NAV receiver sideboard. On some units, Z6TP1 is silkscreened on backside of sideboard). Observe meter.				Z6TP1 and ground	Fluke 801B (adjust for dc operation)	+20.2 vdc.	If necessary, adjust 20.2 V control Z6R14 (figure 802) until result is obtained.
	Observe meter.	UNIT 18V			DC VM	Fluke 801B	+18.0 vdc.	If necessary, adjust 18.0 V control Z6R29 (figure 802) until result is obtained.
	Adjust variable output power supply (connected to 977A-1 27.5 vdc jacks) to +21.0 vdc and observe meter.	UNIT 18V			DC VM	Fluke 801B	+18.0 ±0.5 vdc.	
	Adjust variable output power supply to +31.0 vdc and observe meter. Adjust variable output power supply to +27.5 vdc.	UNIT 18V			DC VM	Fluke 801B	+18.0 ±0.5 vdc.	Tests 1.3 and 1.4 check the operation of the voltage regulator in the 1051B-1 VHF NAV Receiver.
	Observe meter.	UNIT 5V			DC VM	Fluke 801B	+5.0 ±0.25 vdc.	

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQUENCY	PROCEDURE	OUTPUT						
						TEST POINT	TEST EQUIPMENT	RESULT			DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
2.0	Sensitivity Test																
2.1		Ensure that 211-A is adjusted to 108.00 MHz (check with frequency counter such as HP-524D or 5245L). Adjust OUTPUT LEVEL control to 3uv.			Observe meter and record db indication (see mote in COMMENTS column).	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.		Observe meter and record db indication (see note in COMMENTS column).		VL AF		AC VM	Ballantine 310A	Recorded.	NOTE: If no indication is obtained, refer to test 5.0 to ensure that the 1051B-1 VHF NAV Receiver audio output stages are functioning properly.
2.2		Disconnect 479S-3 from 211-A EXT MOD jack. Position 211-A MOD switch to EXT.			Observe meter and record db indication.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.		Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
2.3					Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1.			Not less than 6 db.		Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1.						Not less than 6 db.	If (s+n)/n ratio is less than 6 db, perform the alignment procedures shown in figure 705. After alignment, repeat all steps of test 2.0 before proceeding to test 3.0.
3.0	Receiver quieting																
3.1		Do not reconnect 479S-3 to 211-A at this time. Adjust OUTPUT LEVEL control to 100 uv. Position OSC SEL to XTAL and adjust FREQUENCY control around 114.90 MHz for maximum indication on RF MONITOR meter. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Position MOD switch to 1000~ and check for 30-percent modulation.		114.90 MHz	Observe meter and record db indication.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.	114.90 MHz	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
3.2		Position 211-A MOD switch to EXT.			Observe meter and record db indication.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.		Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
3.3					Subtract db indication obtained in test 3.2 from db indication obtained in test 3.1.			Not less than 30 db.		Subtract db indication obtained in test 3.2 from db indication obtained in test 3.1.						Not less than 30 db.	
4.0	Selectivity	Position OSC SEL switch to MO.			NOTE: An HP-608D Signal Generator can also be used throughout test 4.0.					NOTE: An HP-608D Signal Generator can also be used for test 4.0.							
4.1		Position 211-A MOD switch to 1000~ Adjust OUTPUT LEVEL control to 4 uv. Check for red-line indication on RF MONITOR meter and check for 30-percent modulation (adjust if necessary).			Observe meter and record indication.	Test connector adapter unit J10 and ground	HP-410B	Recorded.		Observe meter and record indication.	VHF AGC			DC VM	HP-410B	Recorded.	
4.2		Adjust OUTPUT LEVEL control to 8 uv. Adjust FREQUENCY control per procedure.			Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	Test connector adapter unit J10 and ground FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or more than 114.9225 MHz).		Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	VHF AGC			DC VM FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or more than 114.9225 MHz).	

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 2 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Observe meter and record db indication (see note in COMMENTS column).		VL AF		AC VM	Ballantine 310A	Recorded.	NOTE: If no indication is obtained, refer to test 5.0 to ensure that the 1051B-1 VHF NAV Receiver audio output stages are functioning properly.
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1.						Not less than 6 db.	If (s+n)/n ratio is less than 6 db, perform the alignment procedures shown in figure 705. After alignment, repeat all steps of test 2.0 before proceeding to test 3.0.
114.90 MHz	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Subtract db indication obtained in test 3.2 from db indication obtained in test 3.1.						Not less than 30 db.	
	NOTE: An HP-608D Signal Generator can also be used for test 4.0.							
	Observe meter and record indication.	VHF AGC			DC VM	HP-410B	Recorded.	
	Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	VHF AGC			DC VM FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or more than 114.9225 MHz).	

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT				
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT		
						TEST POINT	TEST EQUIPMENT	RESULT
4.3		Adjust FREQUENCY control per procedure.			Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Result is same as th recorded in test 4.1.
					Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	FREQUENCY dial	211-A	Recorded (should be equal to or less than 114.8775 MHz).
4.4					Subtract frequency indication obtained in test 4.3 from indication obtained in test 4.2.			Not less th 45 kHz (6-d bandwidth).
4.5		Adjust OUTPUT LEVEL control to 4000 uv. Adjust FREQUENCY control per procedure.			Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Result is same as th recorded in test 4.1.
					Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	FREQUENCY dial	211-A	Recorded (should be equal to or more than 114.855 MHz).
4.6		Adjust FREQUENCY control per procedure.			Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Result is same as th recorded in test 4.1.
					Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	FREQUENCY dial	211-A	Recorded (should be equal to or less than 114.945 MHz).
4.7					Subtract frequency indication obtained in test 4.5 from indication obtained in test 4.6.			Not more than 90 kHz (60-db bandwidth).
5.0	Detector and audio output	Position OSC SEL switch to XTAL and MOD switch to EXT.	Connect 30~ VAR ϕ jack to 211-A EXT MOD jack.					
5.1		Adjust FREQUENCY control around 114.90 MHz until RF MONITOR meter peaks. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Check for 30 percent modulation of 30~ VAR ϕ and adjust MOD LEVEL control if necessary. Adjust OUTPUT LEVEL control to 1000 uv.			Observe meter.	Test connector adapter unit J13 and ground	Ballantine 310A	0.5 ±0.02 vac.
5.2		Adjust OUTPUT LEVEL control to 5 uv. Position MOD switch to 1000~ and check for 30-percent modulation. Adjust MOD LEVEL control if necessary.	Disconnect 30~ VAR ϕ from 211-A.		Observe meter.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	7.75 vac (see NOTE in COMMENTS column).

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 3 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Observe meter and record db indication (see note in COMMENTS column).		VL AF		AC VM	Ballantine 310A	Recorded.	NOTE: If no indication is obtained, refer to test 5.0 to ensure that the 1051B-1 VHF NAV Receiver audio output stages are functioning properly.
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1.						Not less than 6 db.	If (s+n)/n ratio is less than 6 db, perform the alignment procedures shown in figure 705. After alignment, repeat all steps of test 2.0 before proceeding to test 3.0.
114.90 MHz	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Subtract db indication obtained in test 3.2 from db indication obtained in test 3.1.						Not less than 30 db.	
	NOTE: An HP-608D Signal Generator can also be used for test 4.0.							
	Observe meter and record indication.	VHF AGC			DC VM	HP-410B	Recorded.	
	Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	VHF AGC			DC VM FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or more than 114.9225 MHz).	

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT				PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT TEST POINT	OUTPUT TEST EQUIPMENT	OUTPUT RESULT	FREQUENCY	PROCEDURE	OUTPUT DC VOLTAGE	OUTPUT AC VOLTS	OUTPUT CRO	OUTPUT TEST POINT	OUTPUT TEST EQUIPMENT	OUTPUT RESULT	
4.3		Adjust FREQUENCY control per procedure.			Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Result is same as that recorded in test 4.1.		Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Result is same as that recorded in test 4.1.	
					Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	FREQUENCY dial	211-A	Recorded (should be equal to or less than 114.8775 MHz).		Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.				FREQUENCY dial	211-A	Recorded (should be equal to or less than 114.8775 MHz).	
4.4					Subtract frequency indication obtained in test 4.3 from indication obtained in test 4.2.			Not less than 45 kHz (6-db bandwidth).		Subtract frequency indication obtained in test 4.3 from indication obtained in test 4.2.						Not less than 45 kHz (6-db bandwidth).	If 6-db bandwidth is less than 45 kHz, perform the alignment procedures in figure 705. After alignment, repeat preceding steps of test 4.0 before proceeding to test 4.5.
4.5		Adjust OUTPUT LEVEL control to 4000 uv. Adjust FREQUENCY control per procedure.			Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Result is same as that recorded in test 4.1.		Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Result is same as that recorded in test 4.1.	
					Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	FREQUENCY dial	211-A	Recorded (should be equal to or more than 114.855 MHz).		Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.				FREQUENCY dial	211-A	Recorded (should be equal to or more than 114.855 MHz).	
4.6		Adjust FREQUENCY control per procedure.			Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Result is same as that recorded in test 4.1.		Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Result is same as that recorded in test 4.1.	
					Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	FREQUENCY dial	211-A	Recorded (should be equal to or less than 114.945 MHz).		Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.				FREQUENCY dial	211-A	Recorded (should be equal to or less than 114.945 MHz).	
4.7					Subtract frequency indication obtained in test 4.5 from indication obtained in test 4.6.			Not more than 90 kHz (60-db bandwidth).		Subtract frequency indication obtained in test 4.5 from indication obtained in test 4.6.						Not more t than 90 kHz (60-db bandwidth).	If 60-db bandwidth is more than 90 kHz, perform the alignment procedures in figure 705. After alignment, repeat all steps of test 4.0 before proceeding to test 5.0.
5.0	Detector and audio output	Position OSC SEL switch to XTAL and MOD switch to EXT.	Connect 30~ VAR ϕ jack to 211-A EXT MOD jack.														
5.1		Adjust FREQUENCY control around 114.90 MHz until RF MONITOR meter peaks. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Check for 30 percent modulation of 30~ VARϕ and adjust MOD LEVEL control if necessary. Adjust OUTPUT LEVEL control to 1000 uv.			Observe meter.	Test connector adapter unit J13 and ground	Ballantine 310A	0.5 ±0.02 vac.		Observe meter.		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.02 vac.	If necessary, adjust VHF DET control Z3R9 (figure 802) until result is obtained.
5.2		Adjust OUTPUT LEVEL control to 5 uv. Position MOD switch to 1000~ and check for 30-percent modulation. Adjust MOD LEVEL control if necessary.	Disconnect 30~ VARϕ from 211-A.		Observe meter.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	7.75 vac (see NOTE in COMMENTS column).		Observe meter.		VL AF		AC VM	Ballantine 310A	7.75 vac (see NOTE in COMMENTS column).	If necessary, adjust AUD LVL control Z3R6 (figure 802) until result is obtained. NOTE: The 7.75 vac is equivalent to 100 mw across 600 ohms. Higher or lower audio output levels can be adjusted per user requirements if desired.

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 3 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	VHF AGC			DC VM FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or less than 114.8775 MHz).	
	Subtract frequency indication obtained in test 4.3 from indication obtained in test 4.2.						Not less than 45 kHz (6-db bandwidth).	If 6-db bandwidth is less than 45 kHz, perform the alignment procedures in figure 705. After alignment, repeat preceding steps of test 4.0 before proceeding to test 4.5.
	Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	VHF AGC			DC VM FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or more than 114.855 MHz).	
	Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	VHF AGC			DC VM FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or less than 114.945 MHz).	
	Subtract frequency indication obtained in test 4.5 from indication obtained in test 4.6.						Not more t than 90 kHz (60-db bandwidth).	If 60-db bandwidth is more than 90 kHz, perform the alignment procedures in figure 705. After alignment, repeat all steps of test 4.0 before proceeding to test 5.0.
	Observe meter.		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.02 vac.	If necessary, adjust VHF DET control Z3R9 (figure 802) until result is obtained.
	Observe meter.		VL AF		AC VM	Ballantine 310A	7.75 vac (see NOTE in COMMENTS column).	If necessary, adjust AUD LVL control Z3R6 (figure 802) until result is obtained. NOTE: The 7.75 vac is equivalent to 100 mw across 600 ohms. Higher or lower audio output levels can be adjusted per user requirements if desired.

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT				
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT		
						TEST POINT	TEST EQUIPMENT	RESUL
6.0	Agc characteristics	Adjust OUTPUT LEVEL control per procedure.			Observe meter while alternately adjusting 211-A OUTPUT LEVEL control to 5, 10, 100, 1000, 10,000, and 100,000 uv.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	7.75 ±2.2 vac.
7.0	Detector audio frequency response	Adjust OUTPUT LEVEL control to 1000 uv. Position MOD switch to EXT. Connect audio oscillator such as HP-200AB to 211-A EXT MOD jack.			Adjust audio oscillator output frequency to 300 Hz. Ensure that 211-A PERCENT MODULATION meter indicates 30 percent (adjust 211-A MOD LEVEL control if necessary). Check for red-line indication on 211-A RF MONITOR meter (adjust RF LEVEL control if necessary). Observe meter.	Test connector adapter unit J13 and ground	Ballantine 310A	0.5 ±0.15 vac.
7.1					Observe meter while varying audio oscillator output frequency between 300 and 1200 Hz (ensure that 211-A PERCENT MODULATION meter indicates 30 percent and RF MONITOR meter indicates red line).	Test connector adapter unit J13 and ground	Ballantine 310A	0.5 ±0.15 vac.
7.2					Repeat test 7.1, only vary audio oscillator output frequency between 1200 and 14,000 Hz.	Test connector adapter unit J13 and ground	Ballantine 310A	0.5 ±0.25 vac.
8.0	VOR/LOC mode relay				Observe meter.	Test connector adapter unit J26 and ground	HP-410B	0 vdc.
8.1				111.90 MHz	Observe meter.	Test connector adapter unit J26 and ground	HP-410B	+18 vdc.
9.0	Input power			114.90 MHz	Insert a dc ammeter in series with the plus side of the external +27.5 vdc supply. Observe meter.		Ammeter	1.0 +0 -0.5 a.
10.0	Audio test generator and timer adjustment procedures	Remove audio oscillator from 211-A EXT MOD jacks. Reconnect 479S-3 MOD OUTPUT jack to 211-A EXT MOD jack. Position 211-A MOD switch to EXT. Check RF MONITOR meter for red-line (adjust RF LEVEL control if necessary). Check PERCENT MODULATION meter for 30 percent (adjust MOD LEVEL if necessary).			Do not perform the procedures of test 10.0 unless the 1051B-1 VHF NAV Receiver has met the requirements of tests 1.0 through 9.0.			
10.1		Ensure that 211-A FREQUENCY control is adjusted for 114.90-MHz operation. Recheck RF MONITOR and PERCENT MODULATION meter indications.						

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 4 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	VHF AGC			DC VM FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or less than 114.8775 MHz).	
	Subtract frequency indication obtained in test 4.3 from indication obtained in test 4.2.						Not less than 45 kHz (6-db bandwidth).	If 6-db bandwidth is less than 45 kHz, perform the alignment procedures in figure 705. After alignment, repeat preceding steps of test 4.0 before proceeding to test 4.5.
	Observe meter and carefully adjust 211-A FREQUENCY control below 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	VHF AGC			DC VM FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or more than 114.855 MHz).	
	Observe meter and carefully adjust 211-A FREQUENCY control above 114.90 MHz until result is obtained. Observe and record frequency indication on 211-A dial, or use a frequency counter to determine 211-A frequency.	VHF AGC			DC VM FREQUENCY dial	HP-410B 211-A	Result is same as that recorded in test 4.1. Recorded (should be equal to or less than 114.945 MHz).	
	Subtract frequency indication obtained in test 4.5 from indication obtained in test 4.6.						Not more t than 90 kHz (60-db bandwidth).	If 60-db bandwidth is more than 90 kHz, perform the alignment procedures in figure 705. After alignment, repeat all steps of test 4.0 before proceeding to test 5.0.
	Observe meter.		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.02 vac.	If necessary, adjust VHF DET control Z3R9 (figure 802) until result is obtained.
	Observe meter.		VL AF		AC VM	Ballantine 310A	7.75 vac (see NOTE in COMMENTS column).	If necessary, adjust AUD LVL control Z3R6 (figure 802) until result is obtained. NOTE: The 7.75 vac is equivalent to 100 mw across 600 ohms. Higher or lower audio output levels can be adjusted per user requirements if desired.

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQUENCY	PROCEDURE	OUTPUT						
						TEST POINT	TEST EQUIPMENT	RESULT			DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
6.0	Agc characteristics	Adjust OUTPUT LEVEL control per procedure.			Observe meter while alternately adjusting 211-A OUTPUT LEVEL control to 5, 10, 100, 1000, 10,000, and 100,000 uv.	Test jig J9 and J10 (AUDIO LOAD)	Ballantine 310A	7.75 ±2.2 vac.		Observe meter while alternately adjusting 211-A OUTPUT LEVEL control to 5, 10, 100, 1000, 10,000, and 100,000 uv.		VL AF		AC VM	Ballantine 310A	7.75 ±2.2 vac.	
7.0	Detector audio frequency response	Adjust OUTPUT LEVEL control to 1000 uv. Position MOD switch to EXT. Connect audio oscillator such as HP-200AB to 211-A EXT MOD jack.			Adjust audio oscillator output frequency to 300 Hz. Ensure that 211-A PERCENT MODULATION meter indicates 30 percent (adjust 211-A MOD LEVEL control if necessary). Check for red-line indication on 211-A RF MONITOR meter (adjust RF LEVEL control if necessary). Observe meter.	Test connector adapter unit J13 and ground	Ballantine 310A	0.5 ±0.15 vac.		Adjust audio oscillator output frequency to 300 Hz. Ensure that 211-A PERCENT MODULATION meter indicates 30 percent (adjust 211-A MOD LEVEL control if necessary). Check for red-line indication on 211-A RF MONITOR meter (adjust RF LEVEL control if necessary). Observe meter.		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.15 vac.	
7.1					Observe meter while varying audio oscillator output frequency between 300 and 1200 Hz (ensure that 211-A PERCENT MODULATION meter indicates 30 percent and RF MONITOR meter indicates red line).	Test connector adapter unit J13 and ground	Ballantine 310A	0.5 ±0.15 vac.		Observe meter while varying audio oscillator output frequency between 300 and 1200 Hz (ensure that 211-A PERCENT MODULATION meter indicates 30 percent and RF MONITOR meter indicates red line).		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.15 vac.	
7.2					Repeat test 7.1, only vary audio oscillator output frequency between 1200 and 14,000 Hz.	Test connector adapter unit J13 and ground	Ballantine 310A	0.5 ±0.25 vac.		Repeat test 7.1 only vary audio oscillator output frequency between 1200 and 14,000 Hz.		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.25 vac.	
8.0	VOR/LOC mode relay				Observe meter.	Test connector adapter unit J26 and ground	HP-410B	0 vdc.		Observe meter.	ILS 18V			DC VM	HP-410B	0 vdc.	
8.1				111.90 MHz	Observe meter.	Test connector adapter unit J26 and ground	HP-410B	+18 vdc.	111.90 MHz	Position 977A-1 MODE switch to ILS and observe meter.	ILS 18V			DC VM	HP-410B	+18 vdc.	
9.0	Input power			114.90 MHz	Insert a dc ammeter in series with the plus side of the external +27.5 vdc supply. Observe meter.		Ammeter	1.0 +0 -0.5 a.	114.90 MHz	Insert a dc ammeter into the 977A-1 UUT jacks. Observe meter.				UUT jacks	Ammeter	1.0 -0 -0.5 a.	
10.0	Audio test generator and timer adjustment procedures	Remove audio oscillator from 211-A EXT MOD jacks. Reconnect 479S-3 MOD OUTPUT jack to 211-A EXT MOD jack. Position 211-A MOD switch to EXT. Check RF MONITOR meter for red-line (adjust RF LEVEL control if necessary). Check PERCENT MODULATION meter for 30 percent (adjust MOD LEVEL if necessary).			Do not perform the procedures of test 10.0 unless the 1051B-1 VHF NAV Receiver has met the requirements of tests 1.0 through 9.0.					The audio test generator and timer can be tested two ways using the 977A-1 Test Panel. The first method is shown in the following procedures of test 10.0. Before performing the procedures of test 10.0 ensure that the 1051B-1 VHF NAV Receiver has met the requirements of tests 1.0 through 9.0. The second method of testing the audio test generator and timer uses a 977C-1 Test Unit connected to the 977A-1 CARD TEST UNIT connector. The 1051B-1 does not have to be connected to the 977A-1 when a 977C-1 is being used. Refer to figure 706 for the audio test generator and timer test procedures using a 977A-1 and 977C-1.							
10.1		Ensure that 211-A FREQUENCY control is adjusted for 114.90-MHz operation. Recheck RF MONITOR and PERCENT MODULATION meter indications.															

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 4 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Observe meter while alternately adjusting 211-A OUTPUT LEVEL control to 5, 10, 100, 1000, 10,000, and 100,000 uv.		VL AF		AC VM	Ballantine 310A	7.75 ±2.2 vac.	
	Adjust audio oscillator output frequency to 300 Hz. Ensure that 211-A PERCENT MODULATION meter indicates 30 percent (adjust 211-A MOD LEVEL control if necessary). Check for red-line indication on 211-A RF MONITOR meter (adjust RF LEVEL control if necessary). Observe meter.		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.15 vac.	
	Observe meter while varying audio oscillator output frequency between 300 and 1200 Hz (ensure that 211-A PERCENT MODULATION meter indicates 30 percent and RF MONITOR meter indicates red line).		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.15 vac.	
	Repeat test 7.1 only vary audio oscillator output frequency between 1200 and 14,000 Hz.		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.25 vac.	
	Observe meter.	ILS 18V			DC VM	HP-410B	0 vdc.	
111.90 MHz	Position 977A-1 MODE switch to ILS and observe meter.	ILS 18V			DC VM	HP-410B	+18 vdc.	
114.90 MHz	Insert a dc ammeter into the 977A-1 UUT jacks. Observe meter.				UUT jacks	Ammeter	1.0 -0 -0.5 a.	
	The audio test generator and timer can be tested two ways using the 977A-1 Test Panel. The first method is shown in the following procedures of test 10.0. Before performing the procedures of test 10.0 ensure that the 1051B-1 VHF NAV Receiver has met the requirements of tests 1.0 through 9.0. The second method of testing the audio test generator and timer uses a 977C-1 Test Unit connected to the 977A-1 CARD TEST UNIT connector. The 1051B-1 does not have to be connected to the 977A-1 when a 977C-1 is being used. Refer to figure 706 for the audio test generator and timer test procedures using a 977A-1 and 977C-1.							

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT				
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT		
						TEST POINT	TEST EQUIPMENT	RESULT
10.2	Test generator, VOR section				Temporarily disconnect 211-A from test jig J4.			
10.3					Actuate VOR TEST switch (at front of 51RV-2B) and observe counter. Release VOR TEST switch and remove HP-5245L from test jig. NOTE: Disregard the note in the COMMENTS column if the test generator and timer has been modified by performing the wiring options in paragraph 6. B of this section. These wiring options change the timing sequences.	Test jig J9 and J10 (AUDIO LOAD)	HP-5245L or HP-524D	900 ±10 Hz (see note in COMMENTS column).
10.4			FUNCTION SELECTOR to ODR		Reconnect 211-A RF OUTPUT to test jig J4. Observe meter and record indication.	Test connector adapter unit J31 and ground	HP-410B	Recorded.
10.5					Actuate VOR TEST switch (at front of 51RV-2B) and observe meter. Release VOR TEST switch.	Test connector adapter unit J31 and ground	HP-410B	Same as recorded in test 10.4.
10.6					Observe meter, and record indication.	Test connector adapter unit J20 and ground	Ballantine 310A	Recorded.
10.7					Actuate VOR TEST switch (at front of 51RV-2B) and observe indicators. Release VOR TEST switch.	Test connector adapter unit J20 and ground	Ballantine 310A	Same as recorded in test 10.6.
10.8			PHASE ANGLE SELECTOR to 90 degrees		Adjust 479V-3 BEARING DEGREES switch to 0 degree. Actuate VOR TEST switch (at front of 51RV-2B) and observe meter. Release VOR TEST switch.	Test jig J7 and RMI pointer	HP-425A	0 ua on HP-425A, and 180 ±1 degrees on RMI.
10.9	Test generator, ILS section			110.10 MHz	Simultaneously actuate UP/L test switch and DN/R test switch (at front of 51RV-2B) and observe meter. Release both test switches.	Test jig J7	HP-425A	0 ua (centered).
10.10					Simultaneously actuate UP/L test switch and DN/R test switch (at front of 51RV-2B) and observe meter. Release both test switches.	Test jig J5	HP-425A	0 ua (centered).

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 5 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Observe meter while alternately adjusting 211-A OUTPUT LEVEL control to 5, 10, 100, 1000, 10,000, and 100,000 uv.		VL AF		AC VM	Ballantine 310A	7.75 ±2.2 vac.	
	Adjust audio oscillator output frequency to 300 Hz. Ensure that 211-A PERCENT MODULATION meter indicates 30 percent (adjust 211-A MOD LEVEL control if necessary). Check for red-line indication on 211-A RF MONITOR meter (adjust RF LEVEL control if necessary). Observe meter.		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.15 vac.	
	Observe meter while varying audio oscillator output frequency between 300 and 1200 Hz (ensure that 211-A PERCENT MODULATION meter indicates 30 percent and RF MONITOR meter indicates red line).		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.15 vac.	
	Repeat test 7.1 only vary audio oscillator output frequency between 1200 and 14,000 Hz.		VHF DET AF		AC VM	Ballantine 310A	0.5 ±0.25 vac.	
	Observe meter.	ILS 18V			DC VM	HP-410B	0 vdc.	
111.90 MHz	Position 977A-1 MODE switch to ILS and observe meter.	ILS 18V			DC VM	HP-410B	+18 vdc.	
114.90 MHz	Insert a dc ammeter into the 977A-1 UUT jacks. Observe meter.				UUT jacks	Ammeter	1.0 +0 -0.5 a.	
	The audio test generator and timer can be tested two ways using the 977A-1 Test Panel. The first method is shown in the following procedures of test 10.0. Before performing the procedures of test 10.0 ensure that the 1051B-1 VHF NAV Receiver has met the requirements of tests 1.0 through 9.0. The second method of testing the audio test generator and timer uses a 977C-1 Test Unit connected to the 977A-1 CARD TEST UNIT connector. The 1051B-1 does not have to be connected to the 977A-1 when a 977C-1 is being used. Refer to figure 706 for the audio test generator and timer test procedures using a 977A-1 and 977C-1.							

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
						OUTPUT					OUTPUT						
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	TEST POINT	TEST EQUIPMENT	RESULT	FREQUENCY	PROCEDURE	DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
10.2	Test generator, VOR section				Temporarily disconnect 211-A from test jig J4.					Temporarily disconnect 211-A from 977A-1 VHF IN jack. Position 977A-1 MODE switch to VOR.							
10.3					Actuate VOR TEST switch (at front of 51RV-2B) and observe counter. Release VOR TEST switch and remove HP-5245L from test jig. NOTE: Disregard the note in the COMMENTS column if the test generator and timer has been modified by performing the wiring options in paragraph 6. B of this section. These wiring options change the timing sequences.	Test jig J9 and J10 (AUDIO LOAD)	HP-5245L or HP-524D	900 ±10 Hz (see note in COMMENTS column).		Actuate 977A-1 VOR SELF TEST switch and observe counter. Position VOR SELF TEST switch off; remove HP-5245L from 977A-1. NOTE: Disregard the note in the COMMENTS column if the test generator and timer has been modified by performing the wiring options in paragraph 6. B of this section. These wiring options change the timing sequences.			VL AF	CRO	HP-5245L or HP-524D	900 ±10 Hz (see note in COMMENTS column).	If necessary, adjust 900 FREQ control Z2R5 (figure 803) until result is obtained. NOTE: A delay of approximately 3 seconds occurs between the time any of the test generator switches are actuated and an output indication is provided. This delay is normal, and is a function of the timer circuit in the test generator and timer. Also, if any of the test generator switches remain actuated for approximately 23 seconds, the output indication will be removed. This is normal, and is due to the timer circuit in the test generator and timer. It will be necessary to release the test switch momentarily, and actuate the switch again. After approximately 3 seconds have elapsed, the output indication will return.
10.4			FUNCTION SELECTOR to ODR		Reconnect 211-A RF OUTPUT to test jig J4. Observe meter and record indication.	Test connector adapter unit J31 and ground	HP-410B	Recorded.		Reconnect 211-A RF OUTPUT to 977A-1 VHF IN jack. Observe meter and record indication.	9960 FM DET			DC VM	HP-410B	Recorded.	
10.5					Actuate VOR TEST switch (at front of 51RV-2B) and observe meter. Release VOR TEST switch.	Test connector adapter unit J31 and ground	HP-410B	Same as recorded in test 10.4.		Actuate 977A-1 VOR SELF TEST switch and observe meter. Position VOR SELF TEST switch off.	9960 FM DET			DC VM	HP-410B	Same as recorded in test 10.4.	If necessary, adjust 9960 FREQ control Z2R27 (figure 803) until result is obtained.
10.6					Observe meter, and record indication.	Test connector adapter unit J20 and ground	Ballantine 310A	Recorded.		Observe meter and record indication.		30 Hz VAR		AC VM	Ballantine 310A	Recorded.	
10.7					Actuate VOR TEST switch (at front of 51RV-2B) and observe indicators. Release VOR TEST switch.	Test connector adapter unit J20 and ground	Ballantine 310A	Same as recorded in test 10.6.		Actuate 977A-1 VOR SELF TEST switch and observe meter. Position VOR SELF TEST switch off.		30 Hz VAR		AC VM	Ballantine 310A	Same as recorded in test 10.6.	If necessary, adjust 30 Hz LVL control Z2R86 (figure 803) until result is obtained.
10.8			PHASE ANGLE SELECTOR to 90 degrees		Adjust 479V-3 BEARING DEGREES switch to 0 degree. Actuate VOR TEST switch (at front of 51RV-2B) and observe meter. Release VOR TEST switch.	Test jig J7 and RMI pointer	HP-425A	0 ua on HP-425A, and 180 ±1 degrees on RMI.		Adjust 479V-3 BEARING DEGREES switch to 0 degree. Actuate 977A-1 VOR SELF TEST switch and observe indicators. Position VOR SELF TEST switch off.	VL DEV PRI			DC VM and RMI pointer	HP-425A	0 ua on HP-425A, and 180 ±1 degrees on RMI.	If necessary, adjust VOR ZERO control Z2R33 (figure 803) untilresult is obtained.
10.9	Test generator, ILS section			110.10 MHz	Simultaneously actuate UP/L test switch and DN/R test switch (at front of 51RV-2B) and observe meter. Release both test switches.	Test jig J7	HP-425A	0 ua (centered).	110.10 MHz	Position 977A-1 MODE switch to ILS. Simultaneously actuate 977A-1 UP-LT and DN-RT SELF TEST switches and observe meter. Position both test switches off.	VL DEV PRI			DC VM	HP-425A	0 ua (centered).	If necessary, adjust LOC BAL control Z2R70 (figure 803) until result is obtained.
10.10					Simultaneously actuate UP/L test switch and DN/R test switch (at front of 51RV-2B) and observe meter. Release both test switches.	Test jig J5	HP-425A	0 ua (centered).		Simultaneously actuate 977A-1 UP-LT and DN-RT SELF TEST switches and observe meter. Position both test switches off.	GS DEV PRI			DC VM	HP-425A	0 ua (centered).	If necessary, adjust GS BAL control Z2R75 (figure 803) until result is obtained.

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 5 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
'REQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Temporarily disconnect 211-A from 977A-1 VHF IN jack. Position 977A-1 MODE switch to VOR.							
	Actuate 977A-1 VOR SELF TEST switch and observe counter. Position VOR SELF TEST switch off; remove HP-5245L from 977A-1. NOTE: Disregard the note in the COMMENTS column if the test generator and timer has been modified by performing the wiring options in paragraph 6. B of this section. These wiring options change the timing sequences.			VL AF	CRO	HP-5245L or HP-524D	900 ±10 Hz (see note in COMMENTS column).	If necessary, adjust 900 FREQ control Z2R5 (figure 803) until result is obtained. NOTE: A delay of approximately 3 seconds occurs between the time any of the test generator switches are actuated and an output indication is provided. This delay is normal, and is a function of the timer circuit in the test generator and timer. Also, if any of the test generator switches remain actuated for approximately 23 seconds, the output indication will be removed. This is normal, and is due to the timer circuit in the test generator and timer. It will be necessary to release the test switch momentarily, and actuate the switch again. After approximately 3 seconds have elapsed, the output indication will return.
	Reconnect 211-A RF OUTPUT to 977A-1 VHF IN jack. Observe meter and record indication.	9960 FM DET			DC VM	HP-410B	Recorded.	
	Actuate 977A-1 VOR SELF TEST switch and observe meter. Position VOR SELF TEST switch off.	9960 FM DET			DC VM	HP-410B	Same as recorded in test 10.4.	If necessary, adjust 9960 FREQ control Z2R27 (figure 803) until result is obtained.
	Observe meter and record indication.		30 Hz VAR		AC VM	Ballantine 310A	Recorded.	
	Actuate 977A-1 VOR SELF TEST switch and observe meter. Position VOR SELF TEST switch off.		30 Hz VAR		AC VM	Ballantine 310A	Same as recorded in test 10.6.	If necessary, adjust 30 Hz LVL control Z2R86 (figure 803) until result is obtained.
	Adjust 479V-3 BEARING DEGREES switch to 0 degree. Actuate 977A-1 VOR SELF TEST switch and observe indicators. Position VOR SELF TEST switch off.	VL DEV PRI			DC VM and RMI pointer	HP-425A	0 ua on HP-425A, and 180 ±1 degrees on RMI.	If necessary, adjust VOR ZERO control Z2R33 (figure 803) untilresult is obtained.
10.10 MHz	Position 977A-1 MODE switch to ILS. Simultaneously actuate 977A-1 UP-LT and DN-RT SELF TEST switches and observe meter. Position both test switches off.	VL DEV PRI			DC VM	HP-425A	0 ua (centered).	If necessary, adjust LOC BAL control Z2R70 (figure 803) until result is obtained.
	Simultaneously actuate 977A-1 UP-LT and DN-RT SELF TEST switches and observe meter. Position both test switches off.	GS DEV PRI			DC VM	HP-425A	0 ua (centered).	If necessary, adjust GS BAL control Z2R75 (figure 803) until result is obtained.

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT				
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT		
						TEST POINT	TEST EQUIPMENT	RESULT
10.11					Actuate UP/L test switch (at front of 51RV-2B) and observe meter. Release UP/L test switch.	Test jig J7	HP-425A	75 ±2 ua.
10.12					Actuate UP/L test switch (at front of 51RV-2B) and observe meter. Release UP/L test switch. Actuate DN/R test switch (at front of 51RV-2B) and observe both meters.	Test jig J5 Test jig J5 and J7	HP-425A HP-425A (2 required)	75 ±2 ua. 75 ±2 ua.
11.0	End-of-test procedures				Remove power from test equipment and remove test equipment from 51RV-2B test jig. Remove extender cable between interconnect unit and 1051B-1 VHF NAV Receiver rear connector P1. Refer to assembly section in 51RV-2B VOR/ILS Receiver Overhaul Manual (Collins pn 523-0760757) for procedures to install 1051B-1 on interconnect unit, and to install dust cover.			

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 6 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Temporarily disconnect 211-A from 977A-1 VHF IN jack. Position 977A-1 MODE switch to VOR.							
	Actuate 977A-1 VOR SELF TEST switch and observe counter. Position VOR SELF TEST switch off; remove HP-5245L from 977A-1. NOTE: Disregard the note in the COMMENTS column if the test generator and timer has been modified by performing the wiring options in paragraph 6. B of this section. These wiring options change the timing sequences.			VL AF	CRO	HP-5245L or HP-524D	900 ±10 Hz (see note in COMMENTS column).	If necessary, adjust 900 FREQ control Z2R5 (figure 803) until result is obtained. NOTE: A delay of approximately 3 seconds occurs between the time any of the test generator switches are actuated and an output indication is provided. This delay is normal, and is a function of the timer circuit in the test generator and timer. Also, if any of the test generator switches remain actuated for approximately 23 seconds, the output indication will be removed. This is normal, and is due to the timer circuit in the test generator and timer. It will be necessary to release the test switch momentarily, and actuate the switch again. After approximately 3 seconds have elapsed, the output indication will return.
	Reconnect 211-A RF OUTPUT to 977A-1 VHF IN jack. Observe meter and record indication.	9960 FM DET			DC VM	HP-410B	Recorded.	
	Actuate 977A-1 VOR SELF TEST switch and observe meter. Position VOR SELF TEST switch off.	9960 FM DET			DC VM	HP-410B	Same as recorded in test 10.4.	If necessary, adjust 9960 FREQ control Z2R27 (figure 803) until result is obtained.
	Observe meter and record indication.		30 Hz VAR		AC VM	Ballantine 310A	Recorded.	
	Actuate 977A-1 VOR SELF TEST switch and observe meter. Position VOR SELF TEST switch off.		30 Hz VAR		AC VM	Ballantine 310A	Same as recorded in test 10.6.	If necessary, adjust 30 Hz LVL control Z2R86 (figure 803) until result is obtained.
	Adjust 479V-3 BEARING DEGREES switch to 0 degree. Actuate 977A-1 VOR SELF TEST switch and observe indicators. Position VOR SELF TEST switch off.	VL DEV PRI			DC VM and RMI pointer	HP-425A	0 ua on HP-425A, and 180 ±1 degrees on RMI.	If necessary, adjust VOR ZERO control Z2R33 (figure 803) untilresult is obtained.
10.10 MHz	Position 977A-1 MODE switch to ILS. Simultaneously actuate 977A-1 UP-LT and DN-RT SELF TEST switches and observe meter. Position both test switches off.	VL DEV PRI			DC VM	HP-425A	0 ua (centered).	If necessary, adjust LOC BAL control Z2R70 (figure 803) until result is obtained.
	Simultaneously actuate 977A-1 UP-LT and DN-RT SELF TEST switches and observe meter. Position both test switches off.	GS DEV PRI			DC VM	HP-425A	0 ua (centered).	If necessary, adjust GS BAL control Z2R75 (figure 803) until result is obtained.

TEST		TEST EQUIPMENT USED IN PROCEDURE 1 AND PROCEDURE 2		PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
NO.	NAME	211-A SIGNAL GENERATOR	479S-3 AUDIO SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQUENCY	PROCEDURE	OUTPUT						
						TEST POINT	TEST EQUIPMENT	RESULT			DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
10.11					Actuate UP/L test switch (at front of 51RV-2B) and observe meter. Release UP/L test switch.	Test jig J7	HP-425A	75 ±2 ua.		977A-1 UP-LT SELF TEST switch and observe meter. Position UP-LT SELF TEST switch off.	VL DEV PRI			DC VM	HP-425A	75 ±2 ua.	If necessary, adjust LOC LVL control Z2R79 (figure 803) until result is obtained.
10.12					Actuate UP/L test switch (at front of 51RV-2B) and observe meter. Release UP/L test switch. Actuate DN/R test switch (at front of 51RV-2B) and observe both meters.	Test jig J5 Test jig J5 and J7	HP-425A HP-425A (2 required)	75 ±2 ua. 75 ±2 ua.		977A-1 UP-LT SELF switch and observe meter. Position UP-LT SELF TEST switch off. 977A-1 DN-RT SELF TEST switch and observe meter. Position DN-RT SELF TEST switch off.	GS DEV PRI GS DEV PRI VL DEV PRI			DC VM DC VM DC VM	HP-425A HP-425A HP-425A	75 ±2 ua. 75 ±2 ua. 75 ±2 ua.	If necessary, adjust GS LVL control Z2R78 (figure 803) until result is obtained. Repeat tests 10.9, 10.10, and 10.11 if results are not as specified.
11.0	End-of-test procedures				Remove power from test equipment and remove test equipment from 51RV-2B test jig. Remove extender cable between interconnect unit and 1051B-1 VHF NAV Receiver rear connector P1. Refer to assembly section in 51RV-2B VOR/ILS Receiver Overhaul Manual (Collins pn 523-0760757) for procedures to install 1051B-1 on interconnect unit, and to install dust cover.					Remove power from test equipment and remove test equipment and 1051B-1 from 977A-1 Test Panel. Refer to assembly section in 51RV-2B VOR/ILS Receiver Overhaul Manual (Collins pn 523-0760757) for procedures to install 1051B-1 on interconnect unit, and to install dust cover.							

1051B-1 VHF NAV Receiver Planar Assembly, Test Procedures (Sheet 6 of 6)
Figure 704

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	977A-1 UP-LT SELF TEST switch and observe meter. Position UP-LT SELF TEST switch off.	VL DEV PRI			DC VM	HP-425A	75 ±2 ua.	If necessary, adjust LOC LVL control Z2R79 (figure 803) until result is obtained.
	977A-1 UP-LT SELF switch and observe meter. Position UP-LT SELF TEST switch off.	GS DEV PRI			DC VM	HP-425A	75 ±2 ua.	If necessary, adjust GS LVL control Z2R78 (figure 803) until result is obtained.
	977A-1 DN-RT SELF TEST switch and observe meter. Position DN-RT SELF TEST switch off.	GS DEV PRI VL DEV PRI			DC VM DC VM	HP-425A HP-425A	75 ±2 ua. 75 ±2 ua.	Repeat tests 10.9, 10.10, and 10.11 if results are not as specified.
	Remove power from test equipment and remove test equipment and 1051B-1 from 977A-1 Test Panel. Refer to assembly section in 51RV-2B VOR/ILS Receiver Overhaul Manual (Collins pn 523-0760757) for procedures to install 1051B-1 on interconnect unit, and to install dust cover.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQUE
					TEST POINT	TEST EQUIPMENT	RESULT	
0.1	Preliminary	Position OSC SEL to XTAL. Adjust FREQUENCY control around 114.90 MHz for maximum indication on RF MONITOR meter. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Position MOD switch to EXT and disconnect 479S-3 from 211-A EXT MOD jack (no modulation). Adjust OUTPUT LEVEL control to 1000 uv.	114.90 MHz	Do not perform the alignment procedures of tests 1.0 and 2.0 unless directed to do so. The test procedures of figure 704 and the troubleshooting procedures contain directions as to when tests 1.0 and 2.0 of this procedure should be performed. The alignment procedures use a Boonton 211-A Signal Generator as a signal source. However, other generators such as the HP-608D can be used.				114.90
1.0	18 MHz if. alignment			Test setup to be as shown in figure 701 and described in test 0.1 of figure 704.				
1.1				Position 313N-( ) control unit power switch to PWR. Observe meter and adjust Z7C4 (figure 802) for maximum indication (see CAUTION in COMMENTS column).	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained.	
1.2				Observe meter and adjust Z7C1 (figure 802) for maximum indication (see NOTE in COMMENTS column).	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained.	
1.3				Position 313N-( ) power switch to OFF. Remove four screws securing cover to 18-MHz if. assembly Z7 and remove cover. Refer to figure 802 and locate source lead of fet first 18-MHz if. amplifier Z7Q1. Carefully disconnect source lead of Z7Q1. Replace cover on 18-MHz if. assembly and secure with four screws. Position 313N-( ) power switch to PWR.				
1.4		Adjust OUTPUT LEVEL control to 100,000 uv.		Neutralize first 18-MHz if. amplifier by observing meter and carefully adjusting Z7C5 (figure 802) for minimum indication.	Test connector adapter unit J10 and ground	HP-410B	Minimum indication obtained.	
1.5				Position 313N-( ) power switch to OFF. Remove 18-MHz if. assembly cover by removing four screws. Refer to figure 802 and reconnect source lead of Z7Q1. Replace 18-MHz if. assembly cover and secure with four screws. Position 313N-( ) power switch to PWR.				

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 1 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
FREQUENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	977A-1 UP-LT SELF TEST switch and observe meter. Position UP-LT SELF TEST switch off.	VL DEV PRI			DC VM	HP-425A	75 ±2 ua.	If necessary, adjust LOC LVL control Z2R79 (figure 803) until result is obtained.
	977A-1 UP-LT SELF switch and observe meter. Position UP-LT SELF TEST switch off.	GS DEV PRI			DC VM	HP-425A	75 ±2 ua.	If necessary, adjust GS LVL control Z2R78 (figure 803) until result is obtained.
	977A-1 DN-RT SELF TEST switch and observe meter. Position DN-RT SELF TEST switch off.	GS DEV PRI VL DEV PRI			DC VM DC VM	HP-425A HP-425A	75 ±2 ua. 75 ±2 ua.	Repeat tests 10.9, 10.10, and 10.11 if results are not as specified.
	Remove power from test equipment and remove test equipment and 1051B-1 from 977A-1 Test Panel. Refer to assembly section in 51RV-2B VOR/ILS Receiver Overhaul Manual (Collins pn 523-0760757) for procedures to install 1051B-1 on interconnect unit, and to install dust cover.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
					OUTPUT					OUTPUT						
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	TEST POINT	TEST EQUIPMENT	RESULT	FREQUENCY	PROCEDURE	DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
0.1	Preliminary	Position OSC SEL to XTAL. Adjust FREQUENCY control around 114.90 MHz for maximum indication on RF MONITOR meter. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Position MOD switch to EXT and disconnect 479S-3 from 211-A EXT MOD jack (no modulation). Adjust OUTPUT LEVEL control to 1000 uv.	114.90 MHz	Do not perform the alignment procedures of tests 1.0 and 2.0 unless directed to do so. The test procedures of figure 704 and the troubleshooting procedures contain directions as to when tests 1.0 and 2.0 of this procedure should be performed. The alignment procedures use a Boonton 211-A Signal Generator as a signal source. However, other generators such as the HP-608D can be used.				114.90 MHz	Do not perform the alignment procedures of tests 1.0 and 2.0 unless directed to do so. The test procedures of figure 704 and the troubleshooting procedures contain directions as to when tests 1.0 and 2.0 of this procedure should be performed. The alignment procedures use a Boonton 211-A Signal Generator as a signal source. However, other generators such as the HP-608D can be used.							NOTE: The alignment procedures are accomplished by starting at the 18 MHz if. and working back toward the antenna The 18 MHz is aligned first (test 1.0), followed by the vhf tuner/preselector (test 2.0). If, because of trouble in the vhf tuner or preselector, the 18-Mhz if. cannot be aligned, then the procedures of tests 2.0 should be performed first. After completion of test 2.0, return to test 1.0 and complete the procedures before completing test 2.0 again.
1.0	18 MHz if. alignment			Test setup to be as shown in figure 701 and described in test 0.1 of figure 704.					Test setup to be as shown in figure 702 and described in test 0.1 of figure 704.							
1.1				Position 313N-( ) control unit power switch to PWR. Observe meter and adjust Z7C4 (figure 802) for maximum indication (see CAUTION in COMMENTS column).	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained.		Position 977A-1 DC INPUT POWER switch on (up). Observe meter and adjust Z7C4 (figure 802) for maximum indication (see CAUTION in COMMENTS column).	VHF AGC			DC VM	HP-410B	Maximum indication obtained.	CAUTION: ADJUSTMENT OF ALL CAPACITORS AND INDUCTORS MENTIONED IN TESTS 1.0, 2.0, AND 3.0 MUST BE MADE WITH ALL COVERS IN PLACE AS SHOWN IN FIGURE 801. THE ADJUSTMENT TOOLS CAN BE INSERTED THROUGH HOLES PROVIDED IN THE COVERS TO MAKE ADJUSTMENTS.
1.2				Observe meter and adjust Z7C1 (figure 802) for maximum indication (see NOTE in COMMENTS column).	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained.		Observe meter and adjust Z7C1 (figure 802) for maximum indication (see NOTE in COMMENTS column).	VHF AGC			DC VM	HP-410B		NOTE: Completion of this step will result in the necessity of having to sweep the front end of the 1051B-1. Ensure that a sweep generator is available and properly calibrated.
1.3				Position 313N-( ) power switch to OFF. Remove four screws securing cover to 18-MHz if. assembly Z7 and remove cover. Refer to figure 802 and locate source lead of fet first 18-MHz if. amplifier Z7Q1. Carefully disconnect source lead of Z7Q1. Replace cover on 18-MHz if. assembly and secure with four screws. Position 313N-( ) power switch to PWR.					Position 977A-1 DC INPUT POWER switch off. Remove four screws securing cover to 18-MHz if. assembly Z7 and remove cover. Refer to figure 802 and locate source lead of fet first 18-MHz if. amplifier Z7Q1. Carefully disconnect source lead of Z7Q1. Replace cover on 18-MHz if. assembly and secure with four screws. Position 977A-1 DC INPUT POWER switch on.							
1.4		Adjust OUTPUT LEVEL control to 100,000 uv.		Neutralize first 18-MHz if. amplifier by observing meter and carefully adjusting Z7C5 (figure 802) for minimum indication.	Test connector adapter unit J10 and ground	HP-410B	Minimum indication obtained.		Neutralize first 18-MHz if. amplifier by observing meter and carefully adjusting Z7C5 (figure 802) for minimum indication.	VHF AGC			DC VM	HP-410B	Minimum indication obtained.	
1.5				Position 313N-( ) power switch to OFF. Remove 18-MHz if. assembly cover by removing four screws. Refer to figure 802 and reconnect source lead of Z7Q1. Replace 18-MHz if. assembly cover and secure with four screws. Position 313N-( ) power switch to PWR.					Position 977A-1 DC INPUT POWER switch off. Remove 18-MHz if. assembly cover by removing four screws. Refer to figure 802 and reconnect source lead of Z7Q1. Replace 18-MHz if. assembly cover and secure with four screws. Position 977A-1 DC INPUT POWER switch on.							

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 1 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								
;NCY	PROCEDURE	OUTPUT						COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
MHz	Do not perform the alignment procedures of tests 1.0 and 2.0 unless directed to do so. The test procedures of figure 704 and the troubleshooting procedures contain directions as to when tests 1.0 and 2.0 of this procedure should be performed. The alignment procedures use a Boonton 211-A Signal Generator as a signal source. However, other generators such as the HP-608D can be used.							NOTE: The alignment procedures are accomplished by starting at the 18 MHz if. and working back toward the antenna The 18 MHz is aligned first (test 1.0), followed by the vhf tuner/preselector (test 2.0). If, because of trouble in the vhf tuner or preselector, the 18-Mhz if. cannot be aligned, then the procedures of tests 2.0 should be performed first. After completion of test 2.0, return to test 1.0 and complete the procedures before completing test 2.0 again.
	Test setup to be as shown in figure 702 and described in test 0.1 of figure 704.							
	Position 977A-1 DC INPUT POWER switch on (up). Observe meter and adjust Z7C4 (figure 802) for maximum indication (see CAUTION in COMMENTS column).	VHF AGC			DC VM	HP-410B	Maximum indication obtained.	CAUTION: ADJUSTMENT OF ALL CAPACITORS AND INDUCTORS MENTIONED IN TESTS 1.0, 2.0, AND 3.0 MUST BE MADE WITH ALL COVERS IN PLACE AS SHOWN IN FIGURE 801. THE ADJUSTMENT TOOLS CAN BE INSERTED THROUGH HOLES PROVIDED IN THE COVERS TO MAKE ADJUSTMENTS.
	Observe meter and adjust Z7C1 (figure 802) for maximum indication (see NOTE in COMMENTS column).	VHF AGC			DC VM	HP-410B		NOTE: Completion of this step will result in the necessity of having to sweep the front end of the 1051B-1. Ensure that a sweep generator is available and properly calibrated.
	Position 977A-1 DC INPUT POWER switch off. Remove four screws securing cover to 18-MHz if. assembly Z7 and remove cover. Refer to figure 802 and locate source lead of fet first 18-MHz if. amplifier Z7Q1. Carefully disconnect source lead of Z7Q1. Replace cover on 18-MHz if. assembly and secure with four screws. Position 977A-1 DC INPUT POWER switch on.							
	Neutralize first 18-MHz if. amplifier by observing meter and carefully adjusting Z7C5 (figure 802) for minimum indication.	VHF AGC			DC VM	HP-410B	Minimum indication obtained.	
	Position 977A-1 DC INPUT POWER switch off. Remove 18-MHz if. assembly cover by removing four screws. Refer to figure 802 and reconnect source lead of Z7Q1. Replace 18-MHz if. assembly cover and secure with four screws. Position 977A-1 DC INPUT POWER switch on.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQU
					TEST POINT	TEST EQUIPMENT	RESULT	
1.6		See procedure.		Temporarily disconnect 211-A from 51RV-2B test jig VOR/LOC ANT jack.				
1.7				Adjust Boonton 240-A (or equivalent) Sweep Generator for 114.90-MHz operation. Adjust 240-A for 60~ sweep rate and 10-mv output. Connect 240-A RF OUTPUT (50Ω INT Z) jack to 51RV-2B test jig VOR/LOC ANT jack through a Daven RFB-550-50 Attenuation Network. Adjust attenuation network for 0-db attenuation.				
1.8				Refer to figure 802 and locate 18V (top) terminal on power supply Z6. Install a jumper from the 18V (top) terminal (figure 802) to test connector adapter unit jack J10 (VHF AGC).				
1.9				Observe oscilloscope and carefully readjust Z7C4 (figure 802) for maximum indication.	Test connector adapter unit J13 and ground	Oscilloscope	Maximum output obtained.	
1.10				Observe vertical scale on face of scope and select a reference point where scope presentation (trace) crosses this scale. Lightly mark this reference point with a fine point grease pencil. Select 1.0-db attenuation on the Daven RFB-550-50 Attenuation Network. Again observe vertical scale on face of scope and note the scale division difference caused by 1.0 db of attenuation. Determine half of the scale division difference between 0- and 1.0-db presentations. Lightly mark this difference point (0.5-db point) with grease pencil. (See NOTE in COMMENTS column.) Set RFB-550-50 Attenuation Network back to 0 db.	Test connector adapter unit J13 and ground	Oscilloscope		
1.11				Observe oscilloscope and alternately adjust Z7C1 (figure 802) in 18-MHz if. and Z8C20 (figure 802) in the vhf tuner for not more than 0.5-db ripple. Amount of signal required for 0.5-db amplitude change on scope presentation was noted in test 1.10. See NOTE 1 in COMMENTS column.	Test connector adapter unit J13 and ground	Oscilloscope	Minimum ripple (not more than 0.5 db). (See NOTE 2 in COMMENTS column.)	
1.12				Remove Boonton 240-A Sweep Generator, Daven RFB-550-50 Attenuation Network, and oscilloscope. Position 313N-( ) power switch to OFF. Remove jumper between 18V (top) terminal on power supply Z6 and test connector adapter unit jack J10.				

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 2 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
:NCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
MHz	Do not perform the alignment procedures of tests 1.0 and 2.0 unless directed to do so. The test procedures of figure 704 and the troubleshooting procedures contain directions as to when tests 1.0 and 2.0 of this procedure should be performed. The alignment procedures use a Boonton 211-A Signal Generator as a signal source. However, other generators such as the HP-608D can be used.							NOTE: The alignment procedures are accomplished by starting at the 18 MHz if. and working back toward the antenna The 18 MHz is aligned first (test 1.0), followed by the vhf tuner/preselector (test 2.0). If, because of trouble in the vhf tuner or preselector, the 18-Mhz if. cannot be aligned, then the procedures of tests 2.0 should be performed first. After completion of test 2.0, return to test 1.0 and complete the procedures before completing test 2.0 again.
	Test setup to be as shown in figure 702 and described in test 0.1 of figure 704.							
	Position 977A-1 DC INPUT POWER switch on (up). Observe meter and adjust Z7C4 (figure 802) for maximum indication (see CAUTION in COMMENTS column).	VHF AGC			DC VM	HP-410B	Maximum indication obtained.	CAUTION: ADJUSTMENT OF ALL CAPACITORS AND INDUCTORS MENTIONED IN TESTS 1.0, 2.0, AND 3.0 MUST BE MADE WITH ALL COVERS IN PLACE AS SHOWN IN FIGURE 801. THE ADJUSTMENT TOOLS CAN BE INSERTED THROUGH HOLES PROVIDED IN THE COVERS TO MAKE ADJUSTMENTS.
	Observe meter and adjust Z7C1 (figure 802) for maximum indication (see NOTE in COMMENTS column).	VHF AGC			DC VM	HP-410B		NOTE: Completion of this step will result in the necessity of having to sweep the front end of the 1051B-1. Ensure that a sweep generator is available and properly calibrated.
	Position 977A-1 DC INPUT POWER switch off. Remove four screws securing cover to 18-MHz if. assembly Z7 and remove cover. Refer to figure 802 and locate source lead of fet first 18-MHz if. amplifier Z7Q1. Carefully disconnect source lead of Z7Q1. Replace cover on 18-MHz if. assembly and secure with four screws. Position 977A-1 DC INPUT POWER switch on.							
	Neutralize first 18-MHz if. amplifier by observing meter and carefully adjusting Z7C5 (figure 802) for minimum indication.	VHF AGC			DC VM	HP-410B	Minimum indication obtained.	
	Position 977A-1 DC INPUT POWER switch off. Remove 18-MHz if. assembly cover by removing four screws. Refer to figure 802 and reconnect source lead of Z7Q1. Replace 18-MHz if. assembly cover and secure with four screws. Position 977A-1 DC INPUT POWER switch on.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT				PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
					OUTPUT				OUTPUT						
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	TEST POINT	TEST EQUIPMENT	RESULT	FREQUENCY	PROCEDURE	DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
1.6		See procedure.		Temporarily disconnect 211-A from 51RV-2B test jig VOR/LOC ANT jack.					Temporarily disconnect 211-A from 977A-1 VHF IN jack.							
1.7				Adjust Boonton 240-A (or equivalent) Sweep Generator for 114.90-MHz operation. Adjust 240-A for 60~ sweep rate and 10-mv output. Connect 240-A RF OUTPUT (50Ω INT Z) jack to 51RV-2B test jig VOR/LOC ANT jack through a Daven RFB-550-50 Attenuation Network. Adjust attenuation network for 0-db attenuation.					Adjust Boonton 240-A (or equivalent) Sweep Generator for 114.90-MHz operation. Adjust 240-A for 60~ sweep rate and 10-mv output. Connect 240-A RF OUTPUT (50Ω INT Z) jack to 977A-1 VHF IN jack through a Daven RFB-550-50 Attenuation Network. Adjust attenuation network for 0-db attenuation.							
1.8				Refer to figure 802 and locate 18V (top) terminal on power supply Z6. Install a jumper from the 18V (top) terminal (figure 802) to test connector adapter unit jack J10 (VHF AGC).					Refer to figure 802 and locate 18V (top) terminal on power supply Z6. Install a jumper from the 18V (top) terminal (figure 802) to the blue AGC test jack J5 (figure 802) located on the 1051B-1 sideboard.							
1.9				Observe oscilloscope and carefully readjust Z7C4 (figure 802) for maximum indication.	Test connector adapter unit J13 and ground	Oscilloscope	Maximum output obtained.		Observe oscilloscope and carefully readjust Z7C4 (figure 802) for maximum indication.			VHF DET AF	CRO	Oscilloscope	Maximum output obtained.	
1.10				Observe vertical scale on face of scope and select a reference point where scope presentation (trace) crosses this scale. Lightly mark this reference point with a fine point grease pencil. Select 1.0-db attenuation on the Daven RFB-550-50 Attenuation Network. Again observe vertical scale on face of scope and note the scale division difference caused by 1.0 db of attenuation. Determine half of the scale division difference between 0- and 1.0-db presentations. Lightly mark this difference point (0.5-db point) with grease pencil. (See NOTE in COMMENTS column.) Set RFB-550-50 Attenuation Network back to 0 db.	Test connector adapter unit J13 and ground	Oscilloscope			Observe vertical scale on face of scope and select a reference point where scope presentation (trace) crosses this scale. Lightly mark this reference point with a fine grease pencil. Select 1.0-db attenuation on the Daven RFB-550-50 Attenuation Network. Again observe vertical scale on face of scope and note the scale division difference caused by 1.0 db of attenuation. Determine half of the scale division difference between 0- and 1.0-db presentations. Lightly mark this difference point (0.5 db point) with grease pencil. (See NOTE in COMMENTS column.) Set RFB-550-50 Attenuation Network back to 0 db.			VHF DET AF	CRO	Oscilloscope		NOTE: This step is included to ensure that the technician will recognize a 0.5-db difference in the amplitude of the oscilloscope presentation. This will be useful in test 1.11 while adjusting for not more than 0.5 db of ripple.
1.11				Observe oscilloscope and alternately adjust Z7C1 (figure 802) in 18-MHz if. and Z8C20 (figure 802) in the vhf tuner for not more than 0.5-db ripple. Amount of signal required for 0.5-db amplitude change on scope presentation was noted in test 1.10. See NOTE 1 in COMMENTS column.	Test connector adapter unit J13 and ground	Oscilloscope	Minimum ripple (not more than 0.5 db). (See NOTE 2 in COMMENTS column.)		Observe oscilloscope and alternately adjust Z7C1 (figure 802) in 18-MHz if. and Z8C20 (figure 802) in the vhf tuner for not more than 0.5-db ripple. Amount of signal required for 0.5-db amplitude change on scope presentation was noted in test 1.10. See NOTE in COMMENTS column.			VHF DET AF	CRO	Oscilloscope	Minimum ripple (not more than 0.5 db). (See NOTE 2 in COMMENTS column.)	NOTE 1: The notch observed at the left side of the waveform (top of skirt) is a characteristic of the first if. crystal filter, FL1. This notch is normal and dies not indicate ripple. NOTE 2: For maximum selectivity and sensitivity of the RF stages, the amount of ripple should be held to a minimum. Variable capacitors Z7C1 and Z8C20 can be adjusted to provide less than 0.5 db of ripple. Therefore, for maximum performance, capacitors Z7C1 and Z8C20 should be adjusted until there is less than 0.5 db of ripple. However, normal operation will result with a ripple figure of 0.5 db.
1.12				Remove Boonton 240-A Sweep Generator, Daven RFB-550-50 Attenuation Network, and oscilloscope. Position 313N-( ) power switch to OFF. Remove jumper between 18V (top) terminal on power supply Z6 and test connector adapter unit jack J10.					Remove Boonton 240-A Sweep Generator, Daven RFB-550-50 Attenuation Network, and oscilloscope. Position 977A-1 DC INPUT POWER switch off. Remove jumper between 18V (top) terminal on power supply Z6 and the blue AGC jack J5 on the 1051B-1 VHF NAV Receiver sideboard.							

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 2 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
ENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Temporarily disconnect 211-A from 977A-1 VHF IN jack.							
	Adjust Boonton 240-A (or equivalent) Sweep Generator for 114.90-MHz operation. Adjust 240-A for 60~ sweep rate and 10-mv output. Connect 240-A RF OUTPUT (50Ω INT Z) jack to 977A-1 VHF IN jack through a Daven RFB-550-50 Attenuation Network. Adjust attenuation network for 0-db attenuation.							
	Refer to figure 802 and locate 18V (top) terminal on power supply Z6. Install a jumper from the 18V (top) terminal (figure 802) to the blue AGC test jack J5 (figure 802) located on the 1051B-1 sideboard.							
	Observe oscilloscope and carefully readjust Z7C4 (figure 802) for maximum indication.			VHF DET AF	CRO	Oscilloscope	Maximum output obtained.	
	Observe vertical scale on face of scope and select a reference point where scope presentation (trace) crosses this scale. Lightly mark this reference point with a fine grease pencil. Select 1.0-db attenuation on the Daven RFB-550-50 Attenuation Network. Again observe vertical scale on face of scope and note the scale division difference caused by 1.0 db of attenuation. Determine half of the scale division difference between 0- and 1.0-db presentations. Lightly mark this difference point (0.5 db point) with grease pencil. (See NOTE in COMMENTS column.) Set RFB-550-50 Attenuation Network back to 0 db.			VHF DET AF	CRO	Oscilloscope		NOTE: This step is included to ensure that the technician will recognize a 0.5-db difference in the amplitude of the oscilloscope presentation. This will be useful in test 1.11 while adjusting for not more than 0.5 db of ripple.
	Observe oscilloscope and alternately adjust Z7C1 (figure 802) in 18-MHz if. and Z8C20 (figure 802) in the vhf tuner for not more than 0.5-db ripple. Amount of signal required for 0.5-db amplitude change on scope presentation was noted in test 1.10. See NOTE in COMMENTS column.			VHF DET AF	CRO	Oscilloscope	Minimum ripple (not more than 0.5 db). (See NOTE 2 in COMMENTS column.)	NOTE 1: The notch observed at the left side of the waveform (top of skirt) is a characteristic of the first if. crystal filter, FL1. This notch is normal and dies not indicate ripple. NOTE 2: For maximum selectivity and sensitivity of the RF stages, the amount of ripple should be held to a minimum. Variable capacitors Z7C1 and Z8C20 can be adjusted to provide less than 0.5 db of ripple. Therefore, for maximum performance, capacitors Z7C1 and Z8C20 should be adjusted until there is less than 0.5 db of ripple. However, normal operation will result with a ripple figure of 0.5 db.
	Remove Boonton 240-A Sweep Generator, Daven RFB-550-50 Attenuation Network, and oscilloscope. Position 977A-1 DC INPUT POWER switch off. Remove jumper between 18V (top) terminal on power supply Z6 and the blue AGC jack J5 on the 1051B-1 VHF NAV Receiver sideboard.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQU
					TEST POINT	TEST EQUIPMENT	RESULT	
2.0	VHF tuner and first mixer alignment	Connect 211-A per procedure before proceeding. Position OSC SEL to MOD. Adjust FREQUENCY to 108.00 MHz as indicated on 211-A dial. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Readjust FREQUENCY control per procedure. Position MOD switch to 1000~ and check PERCENT MODULATION meter for 30-percent indication (adjust MOD LEVEL control if necessary).	108.00 MHz	Connect 211-A RF OUTPUT jack to 51RV-2B test jig VOR/LOC ANT jack through a 6-db 50-ohm pad. Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained. (See NOTE in COMMENTS column.)	108.00
2.1		Adjust OUTPUT LEVEL control to 3 uv.		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.	
2.2		Position MOD switch to EXT.		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.	
2.3				Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1. If results are as specified, the rf stages should be considered aligned, and no further adjustment or aligning is required. Remove all test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than those specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were replaced, perform tests 2.4 through 2.10 (see NOTE in COMMENTS column). If results other than those specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were NOT replaced, then proceed directly to test 2.11.			The (s+n)/n is approximately 10 db, but not less than 6 db.	
2.4				Perform tests 2.4, 2.5, and 2.6 only if Z8Q1 and/or Z8Q2 have been replaced. Position 313N-( ) power switch OFF. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). Refer to figure 802 and locate Z8R6. Carefully unsolder one lead of R6. Initially adjust resistance decade box to 150 ohms and connect resistance decade box so as to substitute for Z8R6 (see NOTE in COMMENTS column). Dress leads of resistance box along injection lead and out of vhf tuner and first mixer Z8 (figure 802). Replace cover on vhf tuner and first mixer Z8 and secure with six screws. Position 313N-( ) power switch to PWR.				

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 3 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
ENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Temporarily disconnect 211-A from 977A-1 VHF IN jack.							
	Adjust Boonton 240-A (or equivalent) Sweep Generator for 114.90-MHz operation. Adjust 240-A for 60~ sweep rate and 10-mv output. Connect 240-A RF OUTPUT (50Ω INT Z) jack to 977A-1 VHF IN jack through a Daven RFB-550-50 Attenuation Network. Adjust attenuation network for 0-db attenuation.							
	Refer to figure 802 and locate 18V (top) terminal on power supply Z6. Install a jumper from the 18V (top) terminal (figure 802) to the blue AGC test jack J5 (figure 802) located on the 1051B-1 sideboard.							
	Observe oscilloscope and carefully readjust Z7C4 (figure 802) for maximum indication.			VHF DET AF	CRO	Oscilloscope	Maximum output obtained.	
	Observe vertical scale on face of scope and select a reference point where scope presentation (trace) crosses this scale. Lightly mark this reference point with a fine grease pencil. Select 1.0-db attenuation on the Daven RFB-550-50 Attenuation Network. Again observe vertical scale on face of scope and note the scale division difference caused by 1.0 db of attenuation. Determine half of the scale division difference between 0- and 1.0-db presentations. Lightly mark this difference point (0.5 db point) with grease pencil. (See NOTE in COMMENTS column.) Set RFB-550-50 Attenuation Network back to 0 db.			VHF DET AF	CRO	Oscilloscope		NOTE: This step is included to ensure that the technician will recognize a 0.5-db difference in the amplitude of the oscilloscope presentation. This will be useful in test 1.11 while adjusting for not more than 0.5 db of ripple.
	Observe oscilloscope and alternately adjust Z7C1 (figure 802) in 18-MHz if. and Z8C20 (figure 802) in the vhf tuner for not more than 0.5-db ripple. Amount of signal required for 0.5-db amplitude change on scope presentation was noted in test 1.10. See NOTE in COMMENTS column.			VHF DET AF	CRO	Oscilloscope	Minimum ripple (not more than 0.5 db). (See NOTE 2 in COMMENTS column.)	NOTE 1: The notch observed at the left side of the waveform (top of skirt) is a characteristic of the first if. crystal filter, FL1. This notch is normal and dies not indicate ripple. NOTE 2: For maximum selectivity and sensitivity of the RF stages, the amount of ripple should be held to a minimum. Variable capacitors Z7C1 and Z8C20 can be adjusted to provide less than 0.5 db of ripple. Therefore, for maximum performance, capacitors Z7C1 and Z8C20 should be adjusted until there is less than 0.5 db of ripple. However, normal operation will result with a ripple figure of 0.5 db.
	Remove Boonton 240-A Sweep Generator, Daven RFB-550-50 Attenuation Network, and oscilloscope. Position 977A-1 DC INPUT POWER switch off. Remove jumper between 18V (top) terminal on power supply Z6 and the blue AGC jack J5 on the 1051B-1 VHF NAV Receiver sideboard.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
					OUTPUT					OUTPUT						
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	TEST POINT	TEST EQUIPMENT	RESULT	FREQUENCY	PROCEDURE	DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
2.0	VHF tuner and first mixer alignment	Connect 211-A per procedure before proceeding. Position OSC SEL to MOD. Adjust FREQUENCY to 108.00 MHz as indicated on 211-A dial. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Readjust FREQUENCY control per procedure. Position MOD switch to 1000~ and check PERCENT MODULATION meter for 30-percent indication (adjust MOD LEVEL control if necessary).	108.00 MHz	Connect 211-A RF OUTPUT jack to 51RV-2B test jig VOR/LOC ANT jack through a 6-db 50-ohm pad. Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained. (See NOTE in COMMENTS column.)	108.00 MHz	Connect 211-A RF OUTPUT jack to 977A-1 VHF IN jack through a 6-db 50-ohm pad. Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained. (See NOTE in COMMENTS column.)	NOTE: A maximum indication (on the agc line) shows that the 211-A is precisely adjusted to 108.00 MHz.
2.1		Adjust OUTPUT LEVEL control to 3 uv.		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.		Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
2.2		Position MOD switch to EXT.		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.		Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
2.3				Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1. If results are as specified, the rf stages should be considered aligned, and no further adjustment or aligning is required. Remove all test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than those specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were replaced, perform tests 2.4 through 2.10 (see NOTE in COMMENTS column). If results other than those specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were NOT replaced, then proceed directly to test 2.11.			The (s+n)/n is approximately 10 db, but not less than 6 db.		Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1. If results are as specified, the rf stages should be considered aligned, and no further adjustments or aligning is required. Remove all test equipment and refer to figure 704 (test procedure) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than that specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were replaced, perform tests 2.4 through 2.10 (see NOTE in COMMENTS column). If results other than that specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were NOT replaced, then proceed directly to test 2.11.						The (s+n)/n is approximately 10 db, but not less than 6 db.	NOTE: If either Z8Q1 and/or Z8Q2 have been replaced and the specified (s+n)/n ratio is obtained, perform tests 2.4 through 2.10 to optimize performance of first mixer Z8Q1 and Z8Q2.
2.4				Perform tests 2.4, 2.5, and 2.6 only if Z8Q1 and/or Z8Q2 have been replaced. Position 313N-( ) power switch OFF. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). Refer to figure 802 and locate Z8R6. Carefully unsolder one lead of R6. Initially adjust resistance decade box to 150 ohms and connect resistance decade box so as to substitute for Z8R6 (see NOTE in COMMENTS column). Dress leads of resistance box along injection lead and out of vhf tuner and first mixer Z8 (figure 802). Replace cover on vhf tuner and first mixer Z8 and secure with six screws. Position 313N-( ) power switch to PWR.					Perform tests 2.4, 2.5, and 2.6 only if Z8Q1 and/or Z8Q2 have been replaced. Position 977A-1 DC INPUT POWER switch off. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). Refer to figure 802 and locate Z8R6. Carefully unsolder one lead of R6. Initially adjust resistance decade box to 150 ohms and connect resistance decade box so as to substitute for Z8R6 (see NOTE in COMMENTS column). Dress leads of resistance box along injection lead and out of vhf tuner and first mixer Z8 (figure 802). Replace cover on vhf tuner and first mixer Z8 and secure with six screws. Position 977A-1 DC INPUT POWER switch on.							

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 3 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
ENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
MHz	Connect 211-A RF OUTPUT jack to 977A-1 VHF IN jack through a 6-db 50-ohm pad. Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained. (See NOTE in COMMENTS column.)	NOTE: A maximum indication (on the age line) shows that the 211-A is precisely adjusted to 108.00 MHz.
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1. If results are as specified, the rf stages should be considered aligned, and no further adjustments or aligning is required. Remove all test equipment and refer to figure 704 (test procedure) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than that specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were replaced, perform tests 2.4 through 2.10 (see NOTE in COMMENTS column). If results other than that specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were NOT replaced, then proceed directly to test 2.11.						The (s+n)/n is approximately 10 db, but not less than 6 db.	NOTE: If either Z8Q1 and/or Z8Q2 have been replaced and the specified (s+n)/n ratio is obtained, perform tests 2.4 through 2.10 to optimize performance of first mixer Z8Q1 and Z8Q2.
	Perform tests 2.4, 2.5, and 2.6 only if Z8Q1 and/or Z8Q2 have been replaced. Position 977A-1 DC INPUT POWER switch off. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). Refer to figure 802 and locate Z8R6. Carefully unsolder one lead of R6. Initially adjust resistance decade box to 150 ohms and connect resistance decade box so as to substitute for Z8R6 (see NOTE in COMMENTS column). Dress leads of resistance box along injection lead and out of vhf tuner and first mixer Z8 (figure 802). Replace cover on vhf tuner and first mixer Z8 and secure with six screws. Position 977A-1 DC INPUT POWER switch on.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQU
					TEST POINT	TEST EQUIPMENT	RESULT	
2.5		Adjust FREQUENCY control per procedure. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Adjust OUTPUT LEVEL control to 100 uv.	115.50 MHz	Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	115.5(
				Adjust resistance decade box, in turn, to each of the values listed below. Observe meter and record indication for each resistance value. The resistance values are 820, 680, 560, 470, 390, 330, 270, 220, 180, 150, 120, and 100 ohms.	Test connector adapter unit J10 and ground	HP-410B	Indications recorded.	
				Select resistance value that provides greatest meter indication.			Value selected.	
2.6				Position 313N-( ) power switch OFF. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802), and remove resistance decade box. Refer to figure 802 and replace Z8R6 (if not the same as already installed) with selected value as determined in test 2.5. Ensure that wattage rating and tolerance are the same as the Z8R6 being replaced. Position 313N-( ) power switch to PWR.				
2.7		Adjust OUTPUT LEVEL control to 1000 uv. Adjust FREQUENCY control per procedure. Adjust RF LEVEL control for red-line indication on RF MONITOR meter.	108.00 MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	108.0(
2.8		Adjust OUTPUT LEVEL control to 3 uv. Position MOD switch to 1000~ and check PERCENT MODULATION meter for 30 percent indication (adjust MOD LEVEL control if necessary).		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.	
2.9		Position MOD switch to EXT.		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.	
2.10				Subtract db indication obtained in test 2.9 from db indication obtained in test 2.8. If results are as specified, the rf stages should be considered aligned, and no further adjustments or aligning is required (see NOTE in COMMENTS column). Remove all test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than those specified were obtained, proceed to test 2.11.			The (s+n)/n is approximately 10 db, but not less than 6 db.	

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 4 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
ENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
MHz	Connect 211-A RF OUTPUT jack to 977A-1 VHF IN jack through a 6-db 50-ohm pad. Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained. (See NOTE in COMMENTS column.)	NOTE: A maximum indication (on the agc line) shows that the 211-A is precisely adjusted to 108.00 MHz.
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Subtract db indication obtained in test 2.2 from db indication obtained in test 2.1. If results are as specified, the rf stages should be considered aligned, and no further adjustments or aligning is required. Remove all test equipment and refer to figure 704 (test procedure) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than that specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were replaced, perform tests 2.4 through 2.10 (see NOTE in COMMENTS column). If results other than that specified were obtained and either Z8Q1 and/or Z8Q2 (figure 802) in the first mixer were NOT replaced, then proceed directly to test 2.11.						The (s+n)/n is approximately 10 db, but not less than 6 db.	NOTE: If either Z8Q1 and/or Z8Q2 have been replaced and the specified (s+n)/n ratio is obtained, perform tests 2.4 through 2.10 to optimize performance of first mixer Z8Q1 and Z8Q2.
	Perform tests 2.4, 2.5, and 2.6 only if Z8Q1 and/or Z8Q2 have been replaced. Position 977A-1 DC INPUT POWER switch off. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). Refer to figure 802 and locate Z8R6. Carefully unsolder one lead of R6. Initially adjust resistance decade box to 150 ohms and connect resistance decade box so as to substitute for Z8R6 (see NOTE in COMMENTS column). Dress leads of resistance box along injection lead and out of vhf tuner and first mixer Z8 (figure 802). Replace cover on vhf tuner and first mixer Z8 and secure with six screws. Position 977A-1 DC INPUT POWER switch on.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
					OUTPUT					OUTPUT						
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	TEST POINT	TEST EQUIPMENT	RESULT	FREQUENCY	PROCEDURE	DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
2.5		Adjust FREQUENCY control per procedure. Adjust RF LEVEL control for red-line indication on RF MONITOR meter. Adjust OUTPUT LEVEL control to 100 uv.	115.50 MHz	Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	115.50 MHz	Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
				Adjust resistance decade box, in turn, to each of the values listed below. Observe meter and record indication for each resistance value. The resistance values are 820, 680, 560, 470, 390, 330, 270, 220, 180, 150, 120, and 100 ohms.	Test connector adapter unit J10 and ground	HP-410B	Indications recorded.		Adjust resistance decade box, in turn, to each of the values listed below. Observe meter and record indication for each resistance value. The resistance values are 820, 680, 560, 470, 390, 330, 270, 220, 180, 150, 120, and 100 ohms.	VHF AGC			DC VM	HP-410B	Indications recorded.	
				Select resistance value that provides greatest meter indication.			Value selected.		Select resistance value that provides greatest meter indication.						Value selected.	
2.6				Position 313N-( ) power switch OFF. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802), and remove resistance decade box. Refer to figure 802 and replace Z8R6 (if not the same as already installed) with selected value as determined in test 2.5. Ensure that wattage rating and tolerance are the same as the Z8R6 being replaced. Position 313N-( ) power switch to PWR.					Position 977A-1 DC INPUT POWER switch off. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802), and remove resistance decade box. Refer to figure 802 and replace Z8R6 (if not the same as already installed) with selected value as determined in test 2.5. Ensure that wattage rating and tolerance are the same as the Z8R6 being replaced. Position 977A-1 DC INPUT POWER switch on.							
2.7		Adjust OUTPUT LEVEL control to 1000 uv. Adjust FREQUENCY control per procedure. Adjust RF LEVEL control for red-line indication on RF MONITOR meter.	108.00 MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	108.00 MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
2.8		Adjust OUTPUT LEVEL control to 3 uv. Position MOD switch to 1000~ and check PERCENT MODULATION meter for 30 percent indication (adjust MOD LEVEL control if necessary).		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.		Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
2.9		Position MOD switch to EXT.		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.		Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
2.10				Subtract db indication obtained in test 2.9 from db indication obtained in test 2.8. If results are as specified, the rf stages should be considered aligned, and no further adjustments or aligning is required (see NOTE in COMMENTS column). Remove all test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than those specified were obtained, proceed to test 2.11.			The (s+n)/n is approximately 10 db, but not less than 6 db.		Subtract db indication obtained in test 2.9 from db indication obtained in test 2.8. If results are as specified, the rf stages should be considered aligned, and no further adjustments or aligning is required (see NOTE in COMMENTS column). Remove all test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than those specified were obtained, proceed to test 2.11.					The (s+n)/n is approximately 10 db, but not less than 6 db.	NOTE: The remaining tests of the alignment procedures ensure that the preselector is properly aligned and tracked. If (s+n)/n is as specified, and it is desired to check the tracking of the preselector, then the remaining procedures should be completed.

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 4 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
:ENCY F	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
) MHz	Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
	Adjust resistance decade box, in turn, to each of the values listed below. Observe meter and record indication for each resistance value. The resistance values are 820, 680, 560, 470, 390, 330, 270, 220, 180, 150, 120, and 100 ohms.	VHF AGC			DC VM	HP-410B	Indications recorded.	
	Select resistance value that provides greatest meter indication.						Value selected.	
	Position 977A-1 DC INPUT POWER switch off. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802), and remove resistance decade box. Refer to figure 802 and replace Z8R6 (if not the same as already installed) with selected value as determined in test 2.5. Ensure that wattage rating and tolerance are the same as the Z8R6 being replaced. Position 977A-1 DC INPUT POWER switch on.							
) MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Subtract db indication obtained in test 2.9 from db indication obtained in test 2.8. If results are as specified, the rf stages should be considered aligned, and no further adjustments or aligning is required (see NOTE in COMMENTS column). Remove all test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than those specified were obtained, proceed to test 2.11.						The (s+n)/n is approximately 10 db, but not less than 6 db.	NOTE: The remaining tests of the alignment procedures ensure that the preselector is properly aligned and tracked. If (s+n)/n is as specified, and it is desired to check the tracking of the preselector, then the remaining procedures should be completed.

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQU
					TEST POINT	TEST EQUIPMENT	RESULT	
2.11		Adjust FREQUENCY control per procedure. Adjust RF LEVEL control for red-line indication on RF MONITOR meter.	115.50 MHz	Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
2.12		Adjust OUTPUT LEVEL control to 100,000 uv (.1V). Ensure that MOD switch is positioned to EXT and no external equipment is connected to EXT MOD jack. (See NOTE in COMMENTS column.)		Refer to figure 802 and locate Z8L1, Z8L2, and Z8L3 in vhf tuner and first mixer. DO NOT REMOVE COVER. Swamp inductors Z8L2 and Z8L3 (figure 802) using two swamping cores, Collins pn 288-2158-00. Observe meter and adjust Z8C2 (figure 802) until result is obtained.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Minimum (dip) indication obtained.	
2.13				Remove swamping core from Z8L2 and swamp Z8L1 (figure 802). Observe meter and adjust Z8C7 (figure 802) until result is obtained.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Minimum (dip) indication obtained.	
2.14				Remove swamping core from Z8L3 and swamp Z8L2 (figure 802). Observe meter and adjust Z8C12 (figure 802) until result is obtained. See NOTE in COMMENTS column.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Minimum (dip) indication obtained.	
2.15		Adjust FREQUENCY control per procedure. Adjust RF LEVEL control for red-line indication on RF MONITOR meter.	108.00 MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	108.00
2.16				Refer to figure 802 and swamp inductors Z8L2 and Z8L3. Observe and record meter indication while inserting iron slug end of tuning wand (WAL 2540 or equivalent, see NOTE 1 in COMMENTS column) into Z8L1 (figure 802). Observe and record meter indication while inserting brass slug end of tuning wand into Z8L1 (figure 802). If results are as specified, proceed to test 2.19.	Test jig jacks J9 and J10 (AUDIO LOAD) Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A Ballantine 310A	Indication should increase (see NOTE 2 in COMMENTS column). Indication should increase (see NOTE 2 in COMMENTS column).	

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 5 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
'ENCY F	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
) MHz	Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
	Adjust resistance decade box, in turn, to each of the values listed below. Observe meter and record indication for each resistance value. The resistance values are 820, 680, 560, 470, 390, 330, 270, 220, 180, 150, 120, and 100 ohms.	VHF AGC			DC VM	HP-410B	Indications recorded.	
	Select resistance value that provides greatest meter indication.						Value selected.	
	Position 977A-1 DC INPUT POWER switch off. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802), and remove resistance decade box. Refer to figure 802 and replace Z8R6 (if not the same as already installed) with selected value as determined in test 2.5. Ensure that wattage rating and tolerance are the same as the Z8R6 being replaced. Position 977A-1 DC INPUT POWER switch on.							
) MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Subtract db indication obtained in test 2.9 from db indication obtained in test 2.8. If results are as specified, the rf stages should be considered aligned, and no further adjustments or aligning is required (see NOTE in COMMENTS column). Remove all test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. If results other than those specified were obtained, proceed to test 2.11.						The (s+n)/n is approximately 10 db, but not less than 6 db.	NOTE: The remaining tests of the alignment procedures ensure that the preselector is properly aligned and tracked. If (s+n)/n is as specified, and it is desired to check the tracking of the preselector, then the remaining procedures should be completed.

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
					OUTPUT					OUTPUT						
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	TEST POINT	TEST EQUIPMENT	RESULT	FREQUENCY	PROCEDURE	DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
2.11		Adjust FREQUENCY control per procedure. Adjust RF LEVEL control for red-line indication on RF MONITOR meter.	115.50 MHz	Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).		Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
2.12		Adjust OUTPUT LEVEL control to 100,000 uv (.1V). Ensure that MOD switch is positioned to EXT and no external equipment is connected to EXT MOD jack. (See NOTE in COMMENTS column.)		Refer to figure 802 and locate Z8L1, Z8L2, and Z8L3 in vhf tuner and first mixer. DO NOT REMOVE COVER. Swamp inductors Z8L2 and Z8L3 (figure 802) using two swamping cores, Collins pn 288-2158-00. Observe meter and adjust Z8C2 (figure 802) until result is obtained.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Minimum (dip) indication obtained.		Refer to figure 802 and locate Z8L1, Z8L2, and Z8L3 in vhf tuner and first mixer. DO NOT REMOVE COVER. Swamp inductors Z8L2 and Z8L3 (figure 802) using two swamping cores, Collins pn 288-2158-00. Observe meter and adjust Z8C2 (figure 802) until result is obtained.		VL AF		AC VM	Ballantine 310A	Minimum (dip) indication obtained.	NOTE: As alignment of the front end progresses, it may be necessary to reduce the input level of the 211-A to maintain a convenient meter indication.
2.13				Remove swamping core from Z8L2 and swamp Z8L1 (figure 802). Observe meter and adjust Z8C7 (figure 802) until result is obtained.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Minimum (dip) indication obtained.		Remove swamping core from Z8L2 and swamp Z8L1 (figure 802). Observe meter and adjust Z8C7 (figure 802) until result is obtained.		VL AF		AC VM	Ballantine 310A	Minimum (dip) indication obtained.	
2.14				Remove swamping core from Z8L3 and swamp Z8L2 (figure 802). Observe meter and adjust Z8C12 (figure 802) until result is obtained. See NOTE in COMMENTS column.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Minimum (dip) indication obtained.		Remove swamping core from Z8L3 and swamp Z8L2 (figure 802). Observe meter and adjust Z8C12 (figure 802) until result is obtained. See NOTE in COMMENTS column.		VL AF		AC VM	Ballantine 310A	Minimum (dip) indication obtained.	NOTE: Tracking must be checked after Z8C2, C7, and C12 have been adjusted.
2.15		Adjust FREQUENCY control per procedure. Adjust RF LEVEL control for red-line indication on RF MONITOR meter.	108.00 MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	Test connector adapter unit J10 and ground	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	108.00 MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in COMMENTS column).	
2.16				Refer to figure 802 and swamp inductors Z8L2 and Z8L3. Observe and record meter indication while inserting iron slug end of tuning wand (WAL 2540 or equivalent, see NOTE 1 in COMMENTS column) into Z8L1 (figure 802). Observe and record meter indication while inserting brass slug end of tuning wand into Z8L1 (figure 802). If results are as specified, proceed to test 2.19.	Test jig jacks J9 and J10 (AUDIO LOAD) Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A Ballantine 310A	Indication should increase (see NOTE 2 in COMMENTS column). Indication should increase (see NOTE 2 in COMMENTS column).		Refer to figure 802 and swamp inductors Z8L2 and Z8L3. Observe and record meter indication while inserting iron slug end of tuning wand (WAL 2540 or equivalent, see NOTE 1 in COMMENTS column) into Z8L1 (figure 802). Observe and record meter indication while inserting brass slug end of tuning wand into Z8L1 (figure 802). If results are as specified, proceed to test 2.19.		VL AF VL AF		AC VM AC VM	Ballantine 310A Ballantine 310A	Indication should increase (see NOTE 2 in COMMENTS column). Indication should increase (see NOTE 2 in COMMENTS column).	NOTE 1: The WAL 2540 tuning wand contains an iron slug on one end and a brass slug on the other end. Separate iron and brass tuning wands can also be used. NOTE 2: Z8L1 is considered properly tuned if an increase on the meter occurs for both the iron and brass slug. However, normal operation will result if the meter indication remains steady (no increase or no decrease). If the meter indication decreased, Z8L1 needs adjustment. Refer to test 2.17.

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 5 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
ENCY E	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
	Refer to figure 802 and locate Z8L1, Z8L2, and Z8L3 in vhf tuner and first mixer. DO NOT REMOVE COVER. Swamp inductors Z8L2 and Z8L3 (figure 802) using two swamping cores, Collins pn 288-2158-00. Observe meter and adjust Z8C2 (figure 802) until result is obtained.		VL AF		AC VM	Ballantine 310A	Minimum (dip) indication obtained.	NOTE: As alignment of the front end progresses, it may be necessary to reduce the input level of the 211-A to maintain a convenient meter indication.
	Remove swamping core from Z8L2 and swamp Z8L1 (figure 802). Observe meter and adjust Z8C7 (figure 802) until result is obtained.		VL AF		AC VM	Ballantine 310A	Minimum (dip) indication obtained.	
	Remove swamping core from Z8L3 and swamp Z8L2 (figure 802). Observe meter and adjust Z8C12 (figure 802) until result is obtained. See NOTE in COMMENTS column.		VL AF		AC VM	Ballantine 310A	Minimum (dip) indication obtained.	NOTE: Tracking must be checked after Z8C2, C7, and C12 have been adjusted.
MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in COMMENTS column).	
	Refer to figure 802 and swamp inductors Z8L2 and Z8L3. Observe and record meter indication while inserting iron slug end of tuning wand (WAL 2540 or equivalent, see NOTE 1 in COMMENTS column) into Z8L1 (figure 802). Observe and record meter indication while inserting brass slug end of tuning wand into Z8L1 (figure 802). If results are as specified, proceed to test 2.19.		VL AF VL AF		AC VM AC VM	Ballantine 310A Ballantine 310A	Indication should increase (see NOTE 2 in COMMENTS column). Indication should increase (see NOTE 2 in COMMENTS column).	NOTE 1: The WAL 2540 tuning wand contains an iron slug on one end and a brass slug on the other end. Separate iron and brass tuning wands can also be used. NOTE 2: Z8L1 is considered properly tuned if an increase on the meter occurs for both the iron and brass slug. However, normal operation will result if the meter indication remains steady (no increase or no decrease). If the meter indication decreased, Z8L1 needs adjustment. Refer to test 2.17.

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQ
					TEST POINT	TEST EQUIPMENT	RESULT	
2.17				CAUTION: DO NOT PERFORM THE PROCEDURES OF THIS TEST UNLESS A DECREASING METER INDICATION WAS OBTAINED IN TEST 2.16. IF A DECREASING INDICATION WAS NOT OBTAINED (RESULTS ARE PER TEST 2.16), PROCEED TO TEST 2.19. Position 313N-( ) power switch OFF. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). CAUTION: WHILE PERFORMING THE PROCEDURE BELOW, ENSURE THAT INDUCTOR Z8L1 (FIGURE 802) IS NOT MOVED IN ANY DIRECTION OTHER THAN THAN THAT SPECIFIED. From results of test 2.16, if meter indication decreased when iron slug end of tuning wand was inserted into Z8L1, CAREFULLY compress the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Then proceed directly to test 2.18. From results of test 2.16, if meter indication decreased when brass slug end of tuning wand was inserted into Z8L1, CAREFULLY spread the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Proceed to test 2.18.			Z8L1 coils compressed slightly or Z8L1 coils spread slightly.	
2.18				From test 2.17, replace cover on vhf tuner and first mixer Z8 and secure with six screws. Ensure that swamping cores are in Z8L2 and Z8L3 (figure 802). Position 313N-( ) power switch to PWR and repeat test 2.16. If results are as specified in test 2.16, proceed to test 2.19. If results are not as specified in test 2.16, repeat the procedures of tests 2.17, 2.18, and 2.16 as necessary until an increasing meter indication is obtained when both the iron and brass slugs of the tuning wand are inserted into Z8L1. When increasing indication is obtained, proceed to test 2.19.				
2.19				Remove swamping core from Z8L2 (figure 802) and swamp Z8L1 (figure 802). Repeat the procedures of test 2.16 substituting Z8L2 (figure 802) for Z8L1. If results are as specified in test 2.16 for Z8L2, proceed to test 2.20. If results are not as specified in test 2.16 (the meter indication decreases instead of increases), perform tests 2.17 and 2.18 substituting Z8L2 (figure 802) for Z8L1. Observe all cautions with reference to Z8L2. When increasing meter indication is obtained for Z8L2, proceed to test 2.20.				

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 6 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
'ENCY 'E	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Observe meter and adjust 211-A FREQUENCY control around 115.50 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in test 2.0 COMMENTS column).	
	Refer to figure 802 and locate Z8L1, Z8L2, and Z8L3 in vhf tuner and first mixer. DO NOT REMOVE COVER. Swamp inductors Z8L2 and Z8L3 (figure 802) using two swamping cores, Collins pn 288-2158-00. Observe meter and adjust Z8C2 (figure 802) until result is obtained.		VL AF		AC VM	Ballantine 310A	Minimum (dip) indication obtained.	NOTE: As alignment of the front end progresses, it may be necessary to reduce the input level of the 211-A to maintain a convenient meter indication.
	Remove swamping core from Z8L2 and swamp Z8L1 (figure 802). Observe meter and adjust Z8C7 (figure 802) until result is obtained.		VL AF		AC VM	Ballantine 310A	Minimum (dip) indication obtained.	
	Remove swamping core from Z8L3 and swamp Z8L2 (figure 802). Observe meter and adjust Z8C12 (figure 802) until result is obtained. See NOTE in COMMENTS column.		VL AF		AC VM	Ballantine 310A	Minimum (dip) indication obtained.	NOTE: Tracking must be checked after Z8C2, C7, and C12 have been adjusted.
MHz	Observe meter and adjust 211-A FREQUENCY control around 108.00 MHz until result is obtained.	VHF AGC			DC VM	HP-410B	Maximum indication obtained (see NOTE in COMMENTS column).	
	Refer to figure 802 and swamp inductors Z8L2 and Z8L3. Observe and record meter indication while inserting iron slug end of tuning wand (WAL 2540 or equivalent, see NOTE 1 in COMMENTS column) into Z8L1 (figure 802). Observe and record meter indication while inserting brass slug end of tuning wand into Z8L1 (figure 802). If results are as specified, proceed to test 2.19.		VL AF VL AF		AC VM AC VM	Ballantine 310A Ballantine 310A	Indication should increase (see NOTE 2 in COMMENTS column). Indication should increase (see NOTE 2 in COMMENTS column).	NOTE 1: The WAL 2540 tuning wand contains an iron slug on one end and a brass slug on the other end. Separate iron and brass tuning wands can also be used. NOTE 2: Z8L1 is considered properly tuned if an increase on the meter occurs for both the iron and brass slug. However, normal operation will result if the meter indication remains steady (no increase or no decrease). If the meter indication decreased, Z8L1 needs adjustment. Refer to test 2.17.

TEST NO.	TEST NAME	TEST EQUIPMENT USED IN PROCEDURES 1 AND 2: 211-A SIGNAL GENERATOR	TEST EQUIPMENT USED IN PROCEDURES 1 AND 2: 313N-( ) CONTROL	PROCEDURE 1 USING STANDARD TEST EQUIPMENT: PROCEDURE	OUTPUT: TEST POINT	OUTPUT: TEST EQUIPMENT	OUTPUT: RESULT	PROCEDURE 2 USING 977A-1 TEST PANEL: FREQUENCY	PROCEDURE	OUTPUT: DC VOLTAGE	OUTPUT: AC VOLTS	OUTPUT: CRO	OUTPUT: TEST POINT	OUTPUT: TEST EQUIPMENT	OUTPUT: RESULT	COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
2.17				CAUTION: DO NOT PERFORM THE PROCEDURES OF THIS TEST UNLESS A DECREASING METER INDICATION WAS OBTAINED IN TEST 2.16. IF A DECREASING INDICATION WAS NOT OBTAINED (RESULTS ARE PER TEST 2.16), PROCEED TO TEST 2.19. Position 313N-( ) power switch OFF. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). CAUTION: WHILE PERFORMING THE PROCEDURE BELOW, ENSURE THAT INDUCTOR Z8L1 (FIGURE 802) IS NOT MOVED IN ANY DIRECTION OTHER THAN THAN THAT SPECIFIED. From results of test 2.16, if meter indication decreased when iron slug end of tuning wand was inserted into Z8L1, CAREFULLY compress the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Then proceed directly to test 2.18. From results of test 2.16, if meter indication decreased when brass slug end of tuning wand was inserted into Z8L1, CAREFULLY spread the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Proceed to test 2.18.			Z8L1 coils compressed slightly or Z8L1 coils spread slightly.		CAUTION: DO NOT PERFORM THE PROCEDURES OF THIS TEST UNLESS A DECREASING METER INDICATION WAS OBTAINED IN TEST 2.16. IF A DECREASING INDICATION WAS NOT OBTAINED (RESULTS ARE PER TEST 2.16), PROCEED TO TEST 2.19. Position 977A-1 DC INPUT POWER switch off. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). CAUTION: WHILE PERFORMING THE PROCEDURE BELOW, ENSURE THAT INDUCTOR Z8L1 (FIGURE 802) IS NOT MOVED IN ANY DIRECTION OTHER THAN THAT SPECIFIED. From results of test 2.16, if meter indication decreased when iron slug end of tuning wand was inserted into Z8L1, CAREFULLY compress the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Then proceed directly to test 2.18. From results of test 2.16, if meter indication decreased when brass slug end of tuning wand was inserted into Z8L1, CAREFULLY spread the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Proceed to test 2.18.					Z8L1 coils compressed slightly or Z8L1 coils spread slightly.	
2.18				From test 2.17, replace cover on vhf tuner and first mixer Z8 and secure with six screws. Ensure that swamping cores are in Z8L2 and Z8L3 (figure 802). Position 313N-( ) power switch to PWR and repeat test 2.16. If results are as specified in test 2.16, proceed to test 2.19. If results are not as specified in test 2.16, repeat the procedures of tests 2.17, 2.18, and 2.16 as necessary until an increasing meter indication is obtained when both the iron and brass slugs of the tuning wand are inserted into Z8L1. When increasing indication is obtained, proceed to test 2.19.					From test 2.17, replace cover on vhf tuner and first mixer Z8 and secure with six screws. Ensure that swamping cores are in Z8L2 and Z8L3 (figure 802). Position 977A-1 DC INPUT POWER switch on and repeat test 2.16. If results are as specified in test 2.16, proceed to test 2.19. If results are not as specified in test 2.16, repeat the procedures of tests 2.17, 2.18, and 2.16 as necessary until an increasing meter indication is obtained when both the iron and brass slugs of the tuning wand are inserted into Z8L1. When increasing indication is obtained, proceed to test 2.19.						
2.19				Remove swamping core from Z8L2 (figure 802) and swamp Z8L1 (figure 802). Repeat the procedures of test 2.16 substituting Z8L2 (figure 802) for Z8L1. If results are as specified in test 2.16 for Z8L2, proceed to test 2.20. If results are not as specified in test 2.16 (the meter indication decreases instead of increases), perform tests 2.17 and 2.18 substituting Z8L2 (figure 802) for Z8L1. Observe all cautions with reference to Z8L2. When increasing meter indication is obtained for Z8L2, proceed to test 2.20.					Remove swamping core from Z8L2 (figure 802) and swamp Z8L1 (figure 802). Repeat the procedures of test 2.16 substituting Z8L2 (figure 802) for Z8L1. If results are as specified in test 2.16 for Z8L2, proceed to test 2.20. If results are not as specified in test 2.16 (the meter indication decreases instead of increases), perform tests 2.17 and 2.18 substituting Z8L2 (figure 802) for Z8L1. Observe all cautions with reference to Z8L2. When increasing meter indication is obtained for Z8L2, proceed to test 2.20.						

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 6 of 7)
Figure 705

QUENCY EN	PROCEDURE 2 USING 977A-1 TEST PANEL PROCEDURE	OUTPUT DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
	CAUTION: DO NOT PERFORM THE PROCEDURES OF THIS TEST UNLESS A DECREASING METER INDICATION WAS OBTAINED IN TEST 2.16. IF A DECREASING INDICATION WAS NOT OBTAINED (RESULTS ARE PER TEST 2.16), PROCEED TO TEST 2.19. Position 977A-1 DC INPUT POWER switch off. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). CAUTION: WHILE PERFORMING THE PROCEDURE BELOW, ENSURE THAT INDUCTOR Z8L1 (FIGURE 802) IS NOT MOVED IN ANY DIRECTION OTHER THAN THAT SPECIFIED. From results of test 2.16, if meter indication decreased when iron slug end of tuning wand was inserted into Z8L1, CAREFULLY compress the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Then proceed directly to test 2.18. From results of test 2.16, if meter indication decreased when brass slug end of tuning wand was inserted into Z8L1, CAREFULLY spread the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Proceed to test 2.18.						Z8L1 coils compressed slightly or Z8L1 coils spread slightly.	
M	From test 2.17, replace cover on vhf tuner and first mixer Z8 and secure with six screws. Ensure that swamping cores are in Z8L2 and Z8L3 (figure 802). Position 977A-1 DC INPUT POWER switch on and repeat test 2.16. If results are as specified in test 2.16, proceed to test 2.19. If results are not as specified in test 2.16, repeat the procedures of tests 2.17, 2.18, and 2.16 as necessary until an increasing meter indication is obtained when both the iron and brass slugs of the tuning wand are inserted into Z8L1. When increasing indication is obtained, proceed to test 2.19.							
	Remove swamping core from Z8L2 (figure 802) and swamp Z8L1 (figure 802). Repeat the procedures of test 2.16 substituting Z8L2 (figure 802) for Z8L1. If results are as specified in test 2.16 for Z8L2, proceed to test 2.20. If results are not as specified in test 2.16 (the meter indication decreases instead of increases), perform tests 2.17 and 2.18 substituting Z8L2 (figure 802) for Z8L1. Observe all cautions with reference to Z8L2. When increasing meter indication is obtained for Z8L2, proceed to test 2.20.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	OUTPUT			FREQU
					TEST POINT	TEST EQUIPMENT	RESULT	
2.20				Remove swamping core from Z8L3 (figure 802) and swamp Z8L2 (figure 802). Repeat the procedures of test 2.16 substituting Z8L3 (figure 802) for Z8L1. If results are as specified in test 2.16 for Z8L3, proceed to test 2.21 (disregard last sentence in test 2.16 where reference is made to test 2.19). If results are not as specified in test 2.16 (the meter indication decreases instead of increases), perform tests 2.17 and 2.18 substituting Z8L3 (figure 802) for Z8L1. (At one place in test 2.17 and two places in test 2.18, references are made to test 2.19. Disregard references to test 2.19 and substitute test 2.21 during performance of test 2.20.) Observe all cautions with reference to Z8L3. When increasing meter indication is obtained for Z8L3, proceed to test 2.21.				
2.21		Adjust OUTPUT LEVEL control to 3 uv.		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.	
2.22		Position MOD switch to 1000~. Check PERCENT MODULATION meter for 30 percent indication (adjust MOD LEVEL control if necessary).		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.	
2.23				Subtract db indication obtained in test 2.21 from db indication obtained in test 2.22. Remove test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. End of alignment procedures.			The (s+n)/n is approximately 10 db, but not less than 6 db.	

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 7 of 7)
Figure 705

QUENCY	PROCEDURE 2 USING 977A-1 TEST PANEL							COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	CAUTION: DO NOT PERFORM THE PROCEDURES OF THIS TEST UNLESS A DECREASING METER INDICATION WAS OBTAINED IN TEST 2.16. IF A DECREASING INDICATION WAS NOT OBTAINED (RESULTS ARE PER TEST 2.16), PROCEED TO TEST 2.19. Position 977A-1 DC INPUT POWER switch off. Remove six screws securing cover to vhf tuner and first mixer Z8 (figure 802). CAUTION: WHILE PERFORMING THE PROCEDURE BELOW, ENSURE THAT INDUCTOR Z8L1 (FIGURE 802) IS NOT MOVED IN ANY DIRECTION OTHER THAN THAT SPECIFIED. From results of test 2.16, if meter indication decreased when iron slug end of tuning wand was inserted into Z8L1, CAREFULLY compress the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Then proceed directly to test 2.18. From results of test 2.16, if meter indication decreased when brass slug end of tuning wand was inserted into Z8L1, CAREFULLY spread the coils of Z8L1 slightly, ensuring that Z8L1 does not move in a lateral direction. Proceed to test 2.18.						Z8L1 coils compressed slightly or Z8L1 coils spread slightly.	
M	From test 2.17, replace cover on vhf tuner and first mixer Z8 and secure with six screws. Ensure that swamping cores are in Z8L2 and Z8L3 (figure 802). Position 977A-1 DC INPUT POWER switch on and repeat test 2.16. If results are as specified in test 2.16, proceed to test 2.19. If results are not as specified in test 2.16, repeat the procedures of tests 2.17, 2.18, and 2.16 as necessary until an increasing meter indication is obtained when both the iron and brass slugs of the tuning wand are inserted into Z8L1. When increasing indication is obtained, proceed to test 2.19.							
	Remove swamping core from Z8L2 (figure 802) and swamp Z8L1 (figure 802). Repeat the procedures of test 2.16 substituting Z8L2 (figure 802) for Z8L1. If results are as specified in test 2.16 for Z8L2, proceed to test 2.20. If results are not as specified in test 2.16 (the meter indication decreases instead of increases), perform tests 2.17 and 2.18 substituting Z8L2 (figure 802) for Z8L1. Observe all cautions with reference to Z8L2. When increasing meter indication is obtained for Z8L2, proceed to test 2.20.							

TEST		TEST EQUIPMENT USED IN PROCEDURES 1 AND 2	PROCEDURE 1 USING STANDARD TEST EQUIPMENT					PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
					OUTPUT					OUTPUT						
NO.	NAME	211-A SIGNAL GENERATOR	313N-( ) CONTROL	PROCEDURE	TEST POINT	TEST EQUIPMENT	RESULT	FREQUENCY	PROCEDURE	DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
2.20				Remove swamping core from Z8L3 (figure 802) and swamp Z8L2 (figure 802). Repeat the procedures of test 2.16 substituting Z8L3 (figure 802) for Z8L1. If results are as specified in test 2.16 for Z8L3, proceed to test 2.21 (disregard last sentence in test 2.16 where reference is made to test 2.19). If results are not as specified in test 2.16 (the meter indication decreases instead of increases), perform tests 2.17 and 2.18 substituting Z8L3 (figure 802) for Z8L1. (At one place in test 2.17 and two places in test 2.18, references are made to test 2.19. Disregard references to test 2.19 and substitute test 2.21 during performance of test 2.20.) Observe all cautions with reference to Z8L3. When increasing meter indication is obtained for Z8L3, proceed to test 2.21.				Remove swamping core from Z8L3 (figure 802) and swamp Z8L2 (figure 802). Repeat the procedures of test 2.16 substituting Z8L3 (figure 802) for Z8L1. If results are as specified in test 2.16 for Z8L3, proceed to test 2.21 (disregard last sentence in test 2.16 where reference is made to test 2.19). If results are not as specified in test 2.16 (the meter indication decreases instead of increases), perform tests 2.17 and 2.18 substituting Z8L3 (figure 802) for Z8L1. (At one place in test 2.17 and two places in test 2.18, references are made to test 2.19. Disregard references to test 2.19 and substitute test 2.21 during performance of test 2.20.) Observe all cautions with reference to Z8L3. When increasing meter indication is obtained, proceed to test 2.21.						
2.21		Adjust OUTPUT LEVEL control to 3 uv.		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.		Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
2.22		Position MOD switch to 1000~. Check PERCENT MODULATION meter for 30 percent indication (adjust MOD LEVEL control if necessary).		Observe meter and record db indication.	Test jig jacks J9 and J10 (AUDIO LOAD)	Ballantine 310A	Recorded.		Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
2.23				Subtract db indication obtained in test 2.21 from db indication obtained in test 2.22. Remove test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. End of alignment procedures.			The (s+n)/n is approximately 10 db, but not less than 6 db.		Subtract db indication obtained in test 2.21 from db indication obtained in test 2.22. Remove test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. End of alignment procedures.						The (s+n)/n is approximately 10 db, but not less than 6 db.	

1051B-1 VHF NAV Receiver Planar Assembly, Alignment Procedures (Sheet 7 of 7)
Figure 705

PROCEDURE 2 USING 977A-1 TEST PANEL								COMMENTS FOR PROCEDURE 1 AND PROCEDURE 2
ENCY	PROCEDURE	OUTPUT						
		DC VOLTAGE	AC VOLTS	CRO	TEST POINT	TEST EQUIPMENT	RESULT	
	Remove swamping core from Z8L3 (figure 802) and swamp Z8L2 (figure 802). Repeat the procedures of test 2.16 substituting Z8L3 (figure 802) for Z8L1. If results are as specified in test 2.16 for Z8L3, proceed to test 2.21 (disregard last sentence in test 2.16 where reference is made to test 2.19). If results are not as specified in test 2.16 (the meter indication decreases instead of increases), perform tests 2.17 and 2.18 substituting Z8L3 (figure 802) for Z8L1. (At one place in test 2.17 and two places in test 2.18, references are made to test 2.19. Disregard references to test 2.19 and substitute test 2.21 during performance of test 2.20.) Observe all cautions with reference to Z8L3. When increasing meter indication is obtained, proceed to test 2.21.							
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Observe meter and record db indication.		VL AF		AC VM	Ballantine 310A	Recorded.	
	Subtract db indication obtained in test 2.21 from db indication obtained in test 2.22. Remove test equipment and refer to figure 704 (test procedures) and resume testing beginning with test that was in process when reference was made to perform the alignment procedures. End of alignment procedures.						The (s+n)/n is approximately 10 db, but not less than 6 db.	

(To Be Supplied)

Audio Test Generator and Timer Z2 Test Procedures Using 977A-1 Test Panel
and 977C-1 Test Unit
Figure 706

1051B-1 VHF NAV Receiver Planar Assembly - Troubleshooting

1. GENERAL.

This section presents the troubleshooting procedures, troubleshooting charts, test-point locations, and the schematic diagram with operating voltages for the 1051B-1 VHF NAV Receiver Planar Assembly.

Use the procedures in this section to isolate the trouble. Do not perform test procedures first. After a difficulty is located and repaired, the assembly should be completely tested to verify that repairs have not affected other portions of the circuit.

2. TEST EQUIPMENT AND POWER REQUIREMENTS.

A. Test Equipment.

Refer to the special tools, fixtures, and equipment section of this manual for test equipment required to troubleshoot the 1051B-1.

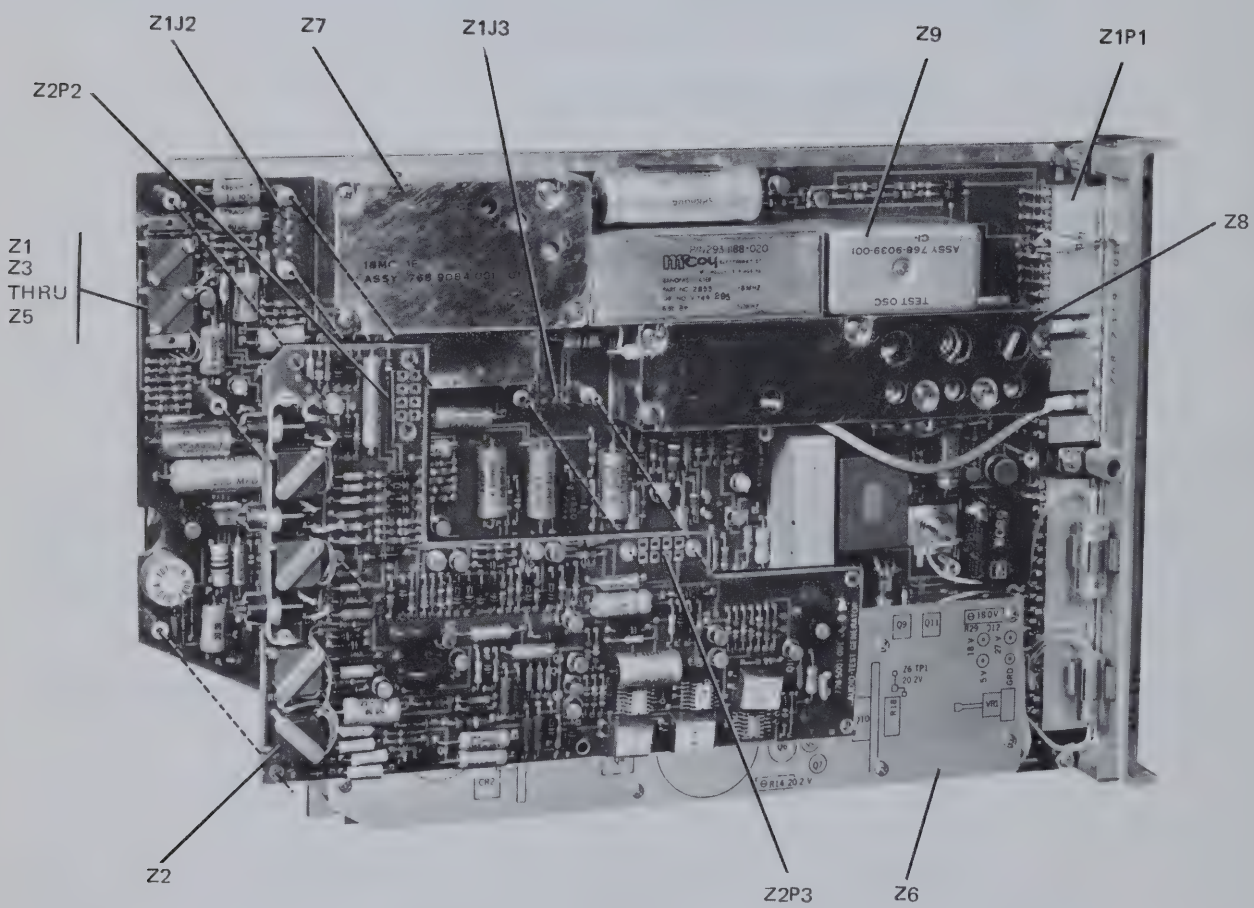
B. Power Requirements.

A +27.5-volt ±2 percent dc power source and a 115-volt ±10 percent, 60-Hz power source are required to troubleshoot the 1051B-1.

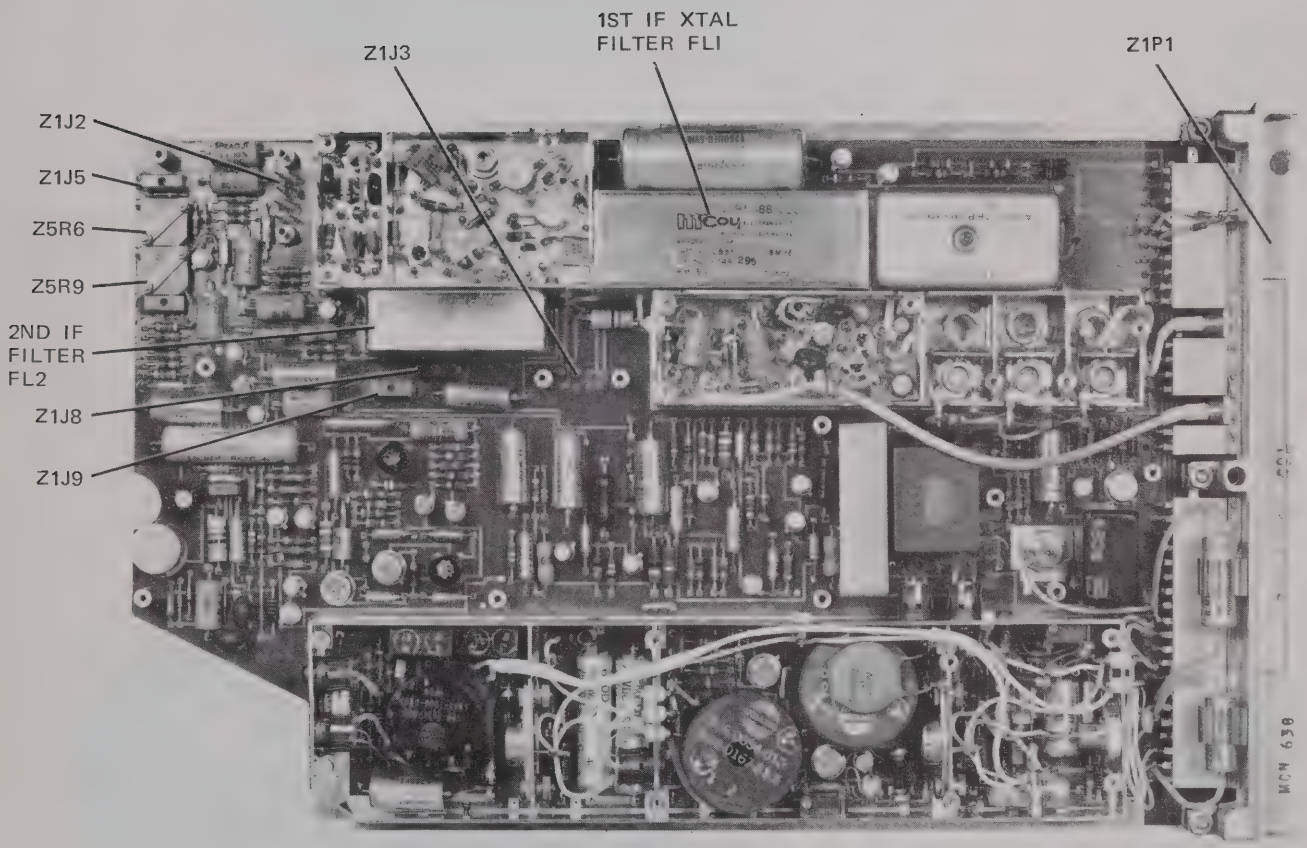
3. PROCEDURES.

Perform the test procedures in figure 704 of the testing section to determine the overall operation of the 1051B-1. When a particular symptom or symptoms are noted, refer to the troubleshooting aids in figure 803A and the voltages and waveforms on the 1051B-1 schematic diagram, figure 804.

The test procedures for audio test generator and timer Z2 using the 977C-1 are given in figure 803B.

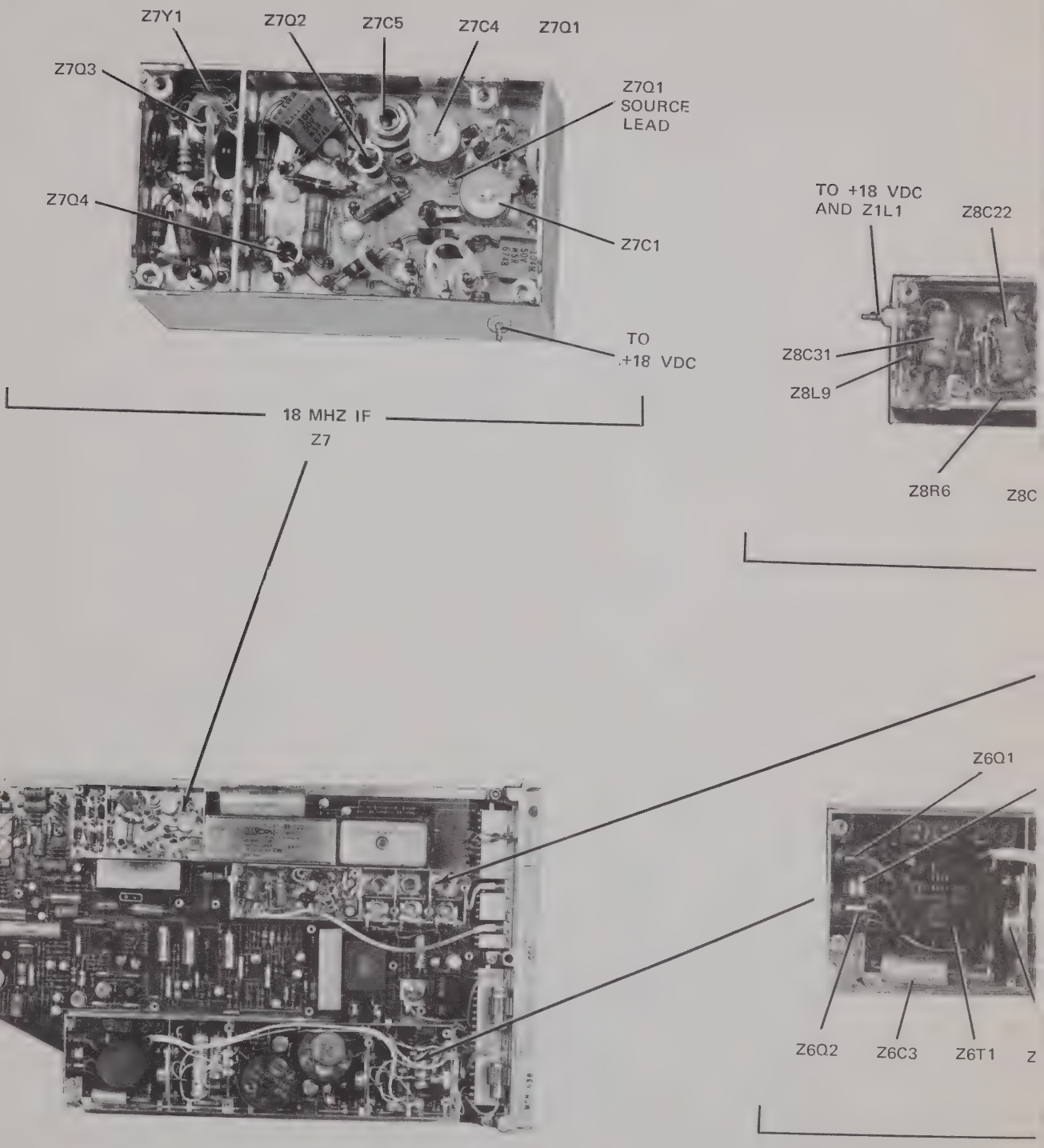


1051B-1 VHF NAV Receiver Planar Assembly, Subassembly Location
Figure 801

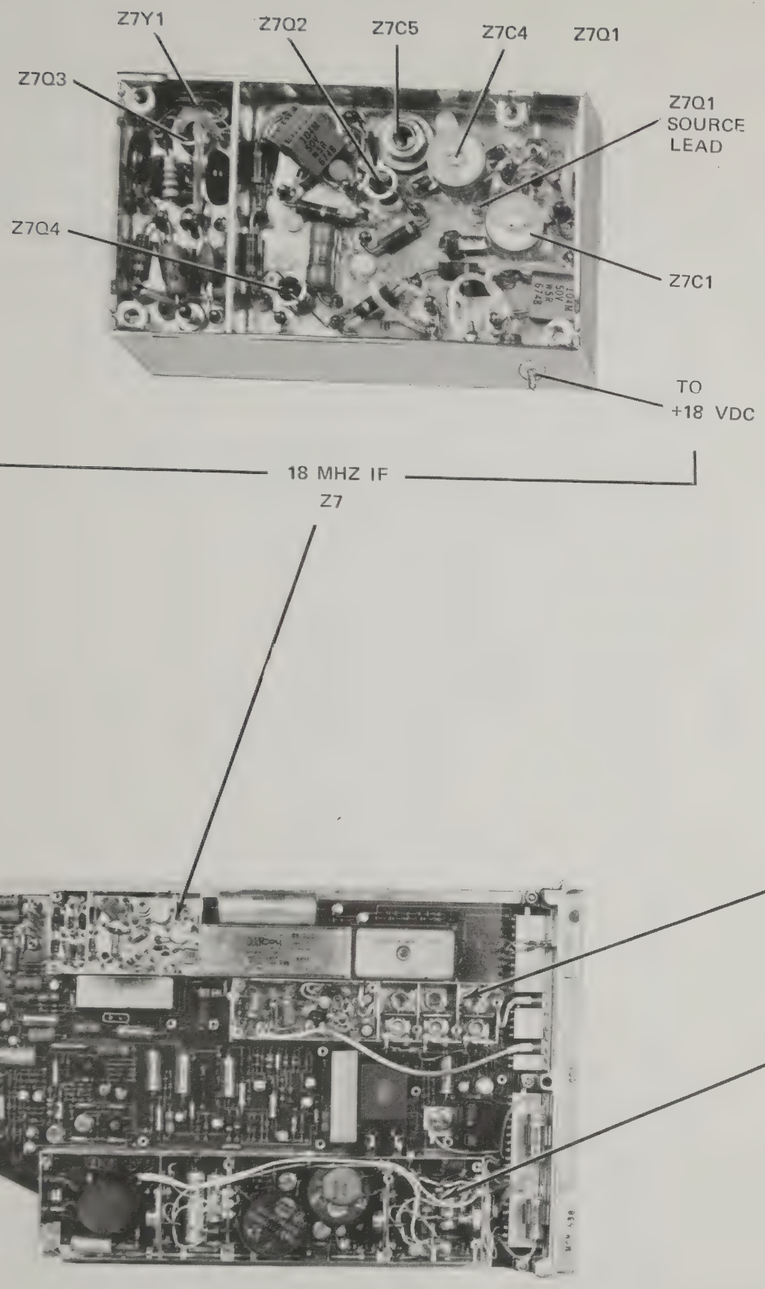


TPO-6609-028

1051B-1 VHF NAV Receiver Planar Assembly, Adjustment Location (Sheet 1 of 2)
Figure 802

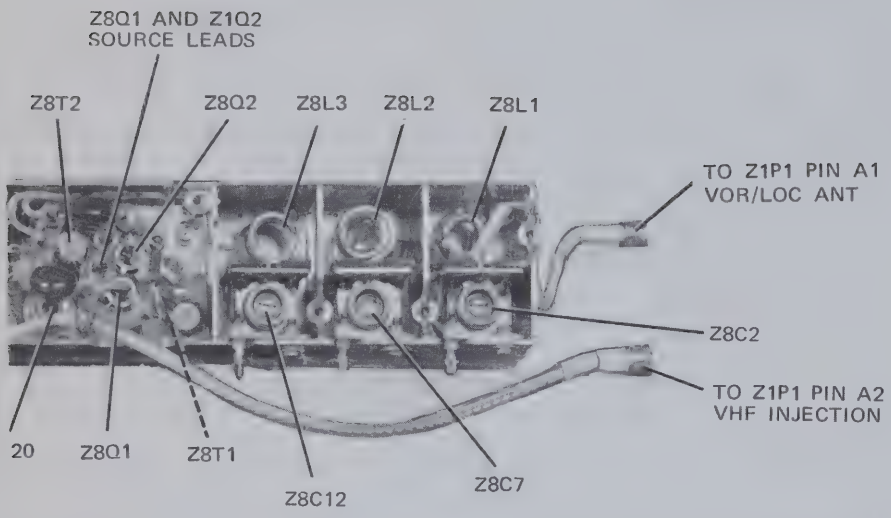


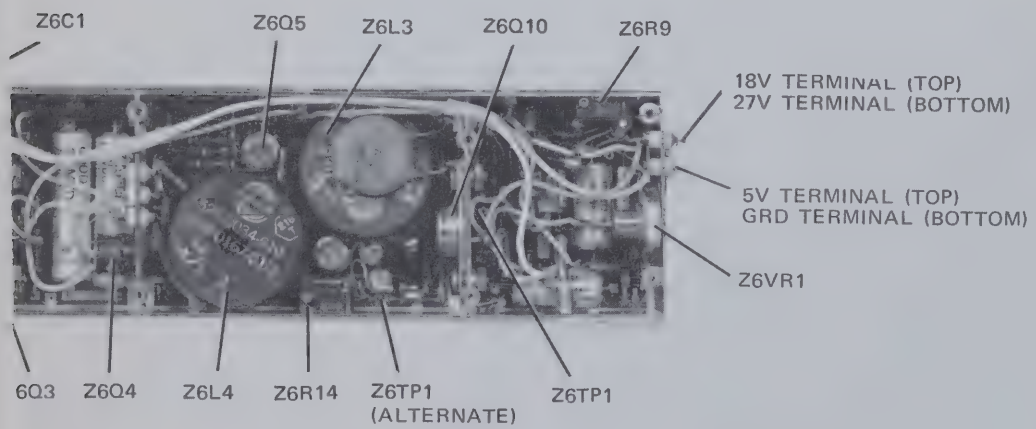
1051B-1 VHF NAV Receiver Planar Assembly, Adjustment Location (Sheet 2 of 2)
Figure 802



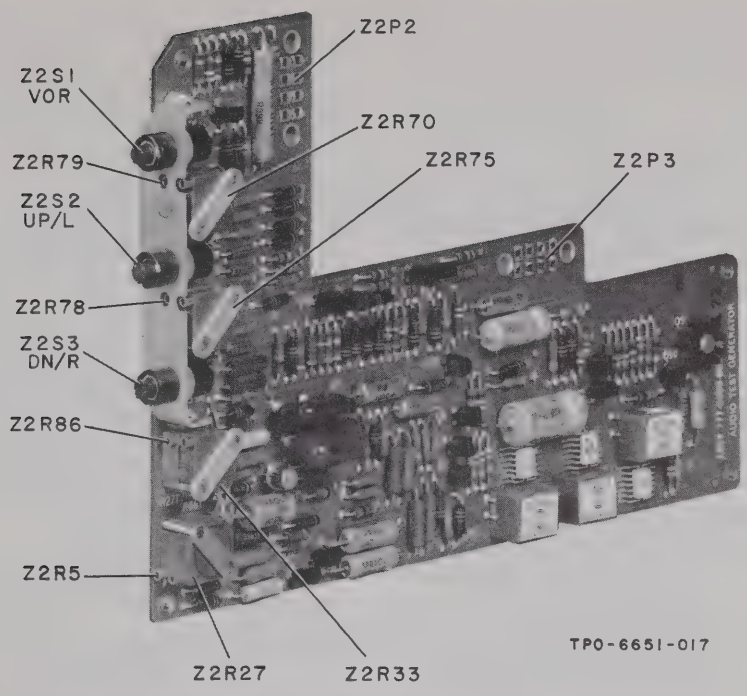
TPO-6609-028

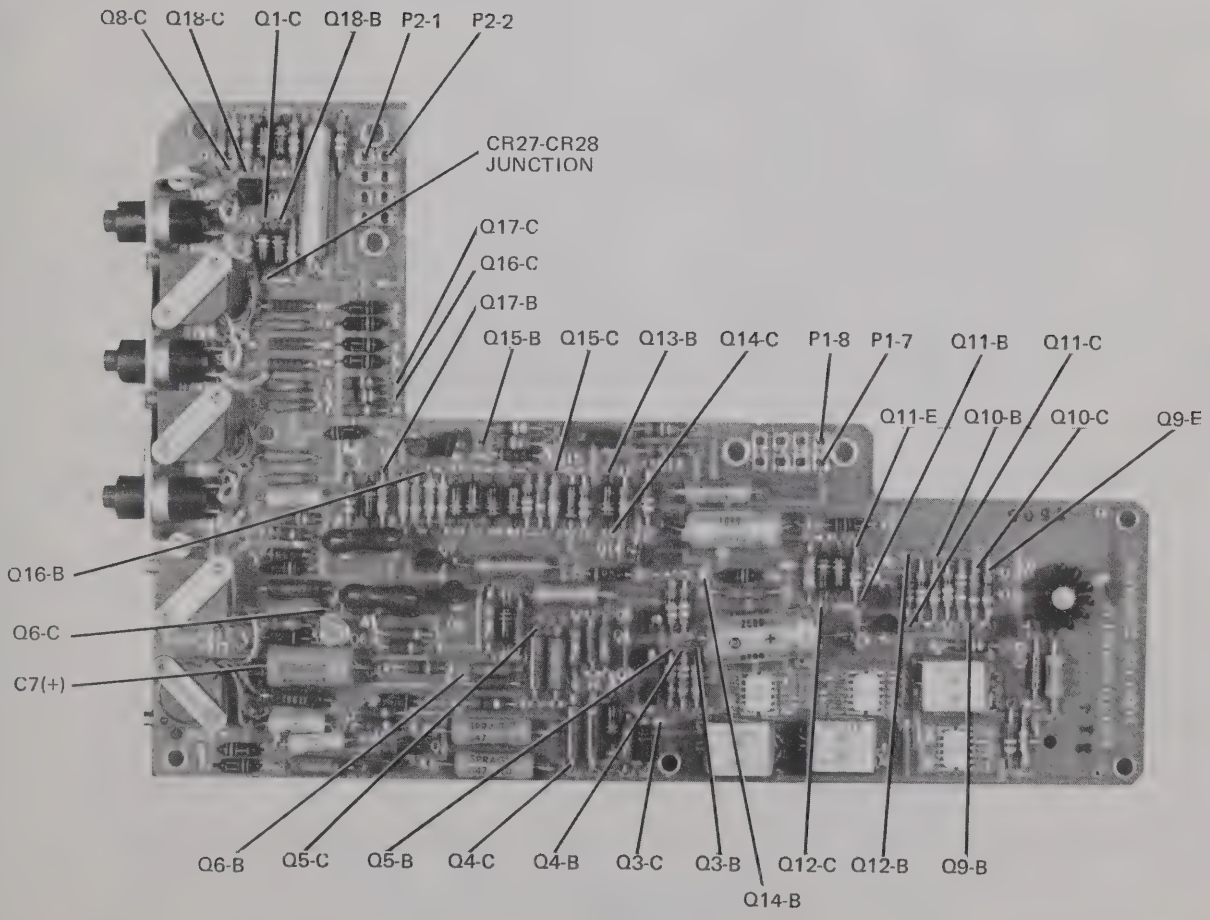
1051B-1 VHF NAV Receiver Planar Assembly, Adjustment Location (Sheet 2 of 2)
Figure 802


Z8Q1 AND Z1Q2
SOURCE LEADS
Z8T2
Z8Q2
Z8L3
Z8L2
Z8L1
TO Z1P1 PIN A1
VOR/LOC ANT
Z8C2
TO Z1P1 PIN A2
VHF INJECTION
20
Z8Q1
Z8T1
Z8C12
Z8C7
– VHF TUNER AND FIRST MIXER
Z8


Z6C1
Z6Q5
Z6L3
Z6Q10
Z6R9
18V TERMINAL (TOP)
27V TERMINAL (BOTTOM)
5V TERMINAL (TOP)
GRD TERMINAL (BOTTOM)
Z6VR1
6Q3
Z6Q4
Z6L4
Z6R14
Z6TP1
(ALTERNATE)
Z6TP1
- +18 VDC/ +5 VDC POWER SUPPLY
Z6

TPO-6609-028


Z2P2
Z2S1
VOR
Z2R70
Z2R79
Z2R75
Z2P3
Z2S2
UP/L
Z2R78
Z2S3
DN/R
Z2R86
Z2R5
Z2R27
Z2R33
TP0-6651-017


Q8-C
Q18-C
Q1-C
Q18-B
P2-1
P2-2
CR27-CR28
JUNCTION
Q17-C
Q16-C
Q17-B
Q15-B
Q15-C
Q13-B
Q14-C
P1-8
P1-7
Q11-B
Q11-C
Q11-E
Q10-B
Q10-C
Q9-E
Q16-B
Q6-C
C7(+)
Q6-B
Q5-C
Q5-B
Q4-C
Q4-B
Q3-C
Q3-B
Q12-C
Q12-B
Q9-B
Q14-B

STEP	TEST	SYMPTOM	PROBABLE CAUSE
1.1	Power supply adjust	Unable to obtain 20.2 Vdc at Z6TP1 by adjusting Z6R14.	Malfunction of 20.2-volt preregulator. Check operation of Q3, Q4, Q5, Q6, Q7, and Q8 and associated components.
1.2		Unable to obtain 18 Vdc at 18-volt terminal by adjusting Z6R29.	Malfunction of 18-volt series regulator. Check operation of Q9, Q10, Q11, and Q12 and associated components.
1.3		18-volt output out of tolerance.	18-volt series regulator malfunction. Refer to step 1.2.
1.4		18-volt output out of tolerance.	18-volt series regulator malfunction. Refer to step 1.2.
1.5		5-volt output out of tolerance.	5-volt inverter and rectifier malfunction. Check Z6CR4, then use oscilloscope to check for approximately 20-kHz square wave at collectors of Q1 and Q2, also on secondary of T1.
2.3	Sensitivity test	(S+n)/n ratio less than 6 dB.	Misaligned - perform alignment procedures, figure 705.
3.3	Receiver quieting	Receiver quieting less than 30 dB.	Circuits in Z5 malfunctioning. Check operation of audio amplifier with an oscilloscope; begin at output amplifier and work toward emitter follower Z5Q1.
4.4	Selectivity	6-dB bandwidth less than 45 kHz.	Misaligned - perform alignment procedures, figure 705. If still out of tolerance, check operation of Z7FL1 by replacing filter with one known to be good.
4.7		60-dB bandwidth greater than 90 kHz.	Same as step 4.4.
5.0	Detector and audio output		
5.1		Unable to obtain 0.5 Vac at VHF DET AF output by adjusting Z3R9.	Check isolation amplifiers Z3Q4 and Z3Q5 and if amplifier stages.

1051B-1 Troubleshooting Aids (Sheet 1 of 3)
Figure 803A

STEP	TEST	SYMPTOM	PROBABLE CAUSE
5.2		Unable to obtain 100 mW across 600 ohms (7.75 Vac) by adjusting AUD LVL control Z5R6.	One or more stages of audio amplifier not functioning. Use oscilloscope to check output amplifiers Q7 and Q8, then work forward through PA DRIVER, PHASE SPLITTER, and AUDIO AMPL, Q3 and Q2.
6.0	Agc characteristics	Unable to obtain desired results.	Check AGC OUTPUT AMPL and AGC DIFFERENTIAL AMPL. Z3Q8, Q6, Q7, Q10, and Q11.
7.0	Detector audio frequency response	Unable to obtain desired results.	Z3CR1 malfunctioning or Z3C14 or Z3R20 out of tolerance.
8.0	VOR/LOC mode relay	Unable to obtain desired results.	First use oscilloscope to check voltage at emitter of Z1Q1. Voltage should be present for step 8.0 (figure 704). Proceed to step 8.1; emitter of Z1Q1 should be grounded. If signal at emitter of Z1Q1 is correct, check operation of Z1Q1, Z1K1, and Z1VR1.
9.0	Input power	Current reading out of tolerance.	Check operation of modules, then check operation of transistors in power supply; if still unable to locate problem, turn off power and make selected resistance and continuity checks while referring to schematic diagram.
10.3	Test generator, VOR section	Unable to adjust Z3R5 to obtain 900 ±10 Hz at test point.	Malfunction of 900-Hz multivibrator; check operation of 900-Hz multivibrator with oscilloscope.
10.8		Unable to adjust Z2R33 to obtain desired results.	Malfunction of audio test generator circuits or RMI servo amplifier; check operation of audio test generator circuits and RMI servo amplifier with oscilloscope.
10.9 (Cont)	Test generator, ILS section	Unable to obtain desired results by adjusting Z2R70.	Malfunction of glideslope/localizer combiner circuits, or audio test generator circuits. Refer to figure 15 on page 42 and troubleshoot glideslope/localizer combiner circuits with

1051B-1 Troubleshooting Aids (Sheet 2 of 3)
Figure 803A

STEP	TEST	SYMPTOM	PROBABLE CAUSE
10.9 (Cont)			oscilloscope. If necessary, check audio test generator circuits; refer to sheet 4 of figure 804.
10.10		Unable to obtain desired results by adjusting Z2R75.	Same as step 10.9.
10.11		Unable to obtain desired results by adjusting Z2R79.	Same as step 10.9.
10.12		Unable to obtain desired results by adjusting Z3R78.	Same as step 10.9.

1051B-1 Troubleshooting Aids (Sheet 3 of 3)
Figure 803A

TEST		PROCEDURE	OUTPUT		
NO	NAME		TEST POINT	TEST EQUIP	RESULTS
1.0	Audio test generator and timer Z2	Connect audio test generator and timer Z2 to the 977C-1.			
1.1	900-Hz oscillator tuning	Set 977A-1 MODE switch to VOR. Set 977C-1 UP L and DN R switch to OFF, VOR TEST switch to VOR, and 900~ DISABLE switch to OFF. Adjust R5 to obtain 900 Hz at C2 (figure 803).	Z2C2	Frequency counter	900 ±10 Hz.
1.2	9960-Hz oscillator tuning	Set 977C-1 900~ DISABLE switch to 900~ DISABLE. Adjust R27 to obtain 9960 Hz at VL TEST GEN jack J15.	VL TEST GEN J15	Frequency counter	9960 ±10 Hz.

Audio Test Generator and Timer Z2, Test Procedures Using 977C-1 (Sheet 1 of 5)
Figure 803B

TEST		PROCEDURE	OUTPUT		
NO	NAME		TEST POINT	TEST EQUIP	RESULTS
1.3	30-Hz level adjust	Connect a jumper between the CR27-CR28 junction (figure 803) and ground. Set 977C-1 900 DISABLE switch to OFF. Adjust R86 so the peak-to-peak amplitude of the lower edge of the VOR test signal is 2.1 volts.	VL TEST GEN J15	Oscilloscope	2.1 ±0.1 volts.
1.4	VOR zero adjust	Adjust R33 to obtain a peak-to-peak voltage of 2.5 volts at C7(+) (figure 803).	C7(+)	Oscilloscope	2.5 ±0.2 volts.
1.5	Localizer level adjust	Set 977A-1 MODE switch to ILS. Set 977C-1 VOR TEST switch to OFF, UP L switch to UP L, and DN R switch to DN R. Adjust R79 to obtain a peak-to-peak voltage of 2.0 volts at J15.	VL TEST GEN J15	Oscilloscope	2.0 ±0.2 volts.
1.6	Localizer balance adjust	Adjust R70 so the offset between the second, fourth, and sixth sections of each half wave of the localizer test signal is no more than 0.02 volt.	VL TEST GEN J15	Oscilloscope	Refer to procedure.
1.7	Glideslope level adjust	Adjust R78 to obtain a peak-to-peak voltage of 9.5 volts at J14.	GS TEST GEN J14	Oscilloscope	9.5 ±0.1 volts.
1.8	Glideslope balance adjust	Adjust R75 so the offset between the second, fourth, and sixth sections of each half wave of the glideslope test signal is no more than 0.1 volt.	GS TEST GEN J14	Oscilloscope	See procedure.
1.9 (Cont)	3-second timer/test enable voltage	Set the sweep rate of the oscilloscope to one second per cm. With the 977A-1 MODE switch set to VOR, measure the time from the instant the VOR TEST switch is set to VOR TEST until the voltage at J13 rises to approximately	TEST ENABLE J13	Oscilloscope (dc)	2.6 to 3.4 seconds.

Audio Test Generator and Timer Z2, Test Procedures Using 977C-1 (Sheet 2 of 5)
Figure 803B

TEST		PROCEDURE	OUTPUT		
NO	NAME		TEST POINT	TEST EQUIP	RESULTS
1.9 (Cont)		18 Vdc. The test enable voltage should remain between 17.0 and 18.4 volts with the VOR TEST switch held on for at least one minute.			
1.10	20-second timer/flag enable voltage	Set the sweep rate of the oscilloscope to five seconds per cm. Set VOR TEST switch to OFF. FLAG ENABLE voltage should be approximately 18 Vdc. This voltage should drop to 0 volt when the VOR TEST switch is set to VOR TEST and remain at 0 volt for 3 seconds. Then it should rise to 18 volts and remain at 18 volts for 20 seconds.	FLAG ENABLE J16	Oscilloscope (dc)	See procedure. Voltage after 4 seconds - 17 to 18.4 V. Time at 18 V - 18 to 24 s.
1.11	Test enable interlock	Check to see that the flag enable voltage goes to zero in 25 seconds or less after the 977C-1 TEST ENABLE switch is set to TEST ENABLE. Return this switch to the OFF position.	FLAG ENABLE J16	Oscilloscope (dc)	See procedure.
1.12 (Cont)	Glideslope test signal	Set the 977A-1 MODE switch to ILS and the 977C-1 DN R switch to DN R. Measure peak-to-peak and the second and fourth segment voltages. Set DN R switch to OFF and the UP L switch to UP L. Measure peak-to-peak and the second and fourth segment voltages. Check to see that no output is present with the UP L and DN R switches set to OFF and the VOR TEST switch set to VOR TEST.	GS TEST GEN J14	Oscilloscope	Peak-to-peak voltage: 7.8 to 8.2 volts. Second and fourth segment voltage: 0.8 to 1 volt.

Audio Test Generator and Timer Z2, Test Procedures Using 977C-1 (Sheet 3 of 5)
Figure 803B

TEST		PROCEDURE	OUTPUT		
NO	NAME		TEST POINT	TEST EQUIP	RESULTS
1.12 (Cont)		Check to see that the glideslope test generator output is present when the UP L, DN R, and both UP L and DN R switches on the audio test generator and timer card are depressed.			
1.13	Localizer test signal	Measure peak-to-peak and the second and fourth segment step voltages with the following: a. The DN R switch set to DN R and the UP L switch set to OFF. b. The UP L switch set to UP L and the DN R switch set to OFF.	VL TEST GEN J15	Oscilloscope	Peak-to-peak voltage: 1.4 to 1.6 volts. Step voltages: 0.27 to 0.31 volt.
1.14	VOR test signal	Connect the CR27-CR28 junction (figure 803) to ground. Set the 977C-1 VOR-ILS switch to VOR and the 977C-1 VOR TEST switch to VOR TEST. a. Measure the peak-to-peak voltage of the composite VOR test signal. b. Measure the amplitude of the lower edge of the signal. c. Remove the ground from the CR27-CR28 junction. Measure the amplitude of the 900-Hz component at the positive peak. Set the 977C-1 VOR TEST switch to OFF. Check to see that the VOR test output is present when the VOR test	VL TEST GEN J15	Oscilloscope	a. 4.4 to 5.2 volts. b. 1.9 to 2.3 volts. c. 0.6 to 0.8 volt.
(Cont)					

Audio Test Generator and Timer Z2, Test Procedures Using 977C-1 (Sheet 4 of 5)
Figure 803B

TEST		PROCEDURE	OUTPUT		
NO	NAME		TEST POINT	TEST EQUIP	RESULTS
1.14 (Cont)		switch on the audio test generator and timer card is depressed. Check to see that no output is present when the DN R and UP L switches are turned on.			

Audio Test Generator and Timer Z2, Test Procedures Using 977C-1 (Sheet 5 of 5)
Figure 803B

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
	A1	Change R2 from 1620 to 1330 ohms, R5 from 1 kΩ to 2 kΩ, and R6 from 4640 Ω to 3920 Ω.		
	A2	Change R51 from 178 kΩ to 162 kΩ.		
	A3	Add R90 and C14.		
	A4	Change C5 and C6 from 4700 pF to 4300 pF.		
	A5	Add R91.		
	A6	Add R88 and R89 and change R75 from 10 kΩ to 5 kΩ.		
	A8	Add Q5 and R21.		
	A7	Change Z6R1 from 100 to 47 ohms and Z6C2 from 2200 to 4700 pF to reduce power dissipation of Z6Q1 and Z6Q2.	51RV-2B SB 9	MCN 2145

1051B-1 VHF NAV Receiver Planar Assembly, Schematic Diagram (Sheet A)
Figure 804

1051B-1 VHF NAV Receiver Planar Assembly - Storage Instructions

1. GENERAL.

This section presents storage instructions for the 1051B-1 VHF NAV Receiver Planar Assembly. The assembly should be wrapped in a plastic bag and stored in a suitable carton. A 16-unit bag of desiccant should also be placed with the assembly.

1051B-1 VHF NAV Receiver Planar Assembly - Special Tools, Fixtures, and Equipment

1. GENERAL.

This section presents a list of special tools, fixtures, and equipment required for the test or overhaul of the 1051B-1 VHF NAV Receiver Planar Assembly.

2. TEST EQUIPMENT REQUIRED.

Figure 1001 lists the equipment required to test, troubleshoot, and overhaul the 1051B-1 VHF NAV Receiver. Any substitution of test equipment must be equivalent to, or better than, that which is listed.

EQUIPMENT	MANUFACTURER AND TYPE
51RV-2B test jig or 977A-1 Test Panel	To be locally fabricated (figure 1003) Collins part number 777-1356-001
Test connector adapter unit	To be locally fabricated (figure 1005) NOTE: The test connector adapter unit is used with the 51RV-2B test jig (figure 1003). The 51RV-2B test jig and the test connector adapter unit are not required if the 977A-1 Test Panel is used.
Vhf signal generator	Boonton 211-A or HP-608D
Audio signal generator	Collins 479S-3, part number 505-4070-005
Audio oscillator	HP-200AB
Precision track selector	Collins 479V-3, part number 522-1339-000
Sweep generator	Boonton 240A
Frequency counter	HP-524D or HP-5245L (both with suitable converter units; HP-525B for the HP-524D, and HP-5253B for the HP-5245L)
Microvolt/ammeter	HP-425A
Vtvm (ac)	Ballantine 310A, 300, or HP 400D or 400H

Test Equipment Required (Sheet 1 of 2)
Figure 1001

EQUIPMENT	MANUFACTURER AND TYPE
Vtvm (dc)	HP-410B or 410C
Differential voltmeter (dc)	Fluke model 801B
Oscilloscope	DuMont 304-A or Tektronix 543
Attenuation network	Daven RFB-550-50
6-db, 50-ohm pad and cable (included with 211-A)	Boonton 505B and 514B, or Measurements Corp. type 80-Z43 pad
Power supply	+21 to +31 vdc variable, ±2 percent regulated power supply
Adjustment tool	JFD no. 5284
Tuning wand	WAL no. 2540
1051B-1 VHF NAV Receiver Planar Assembly extender cable	To be locally fabricated (figure 1004)
Repair tools	Listed in figure 1002

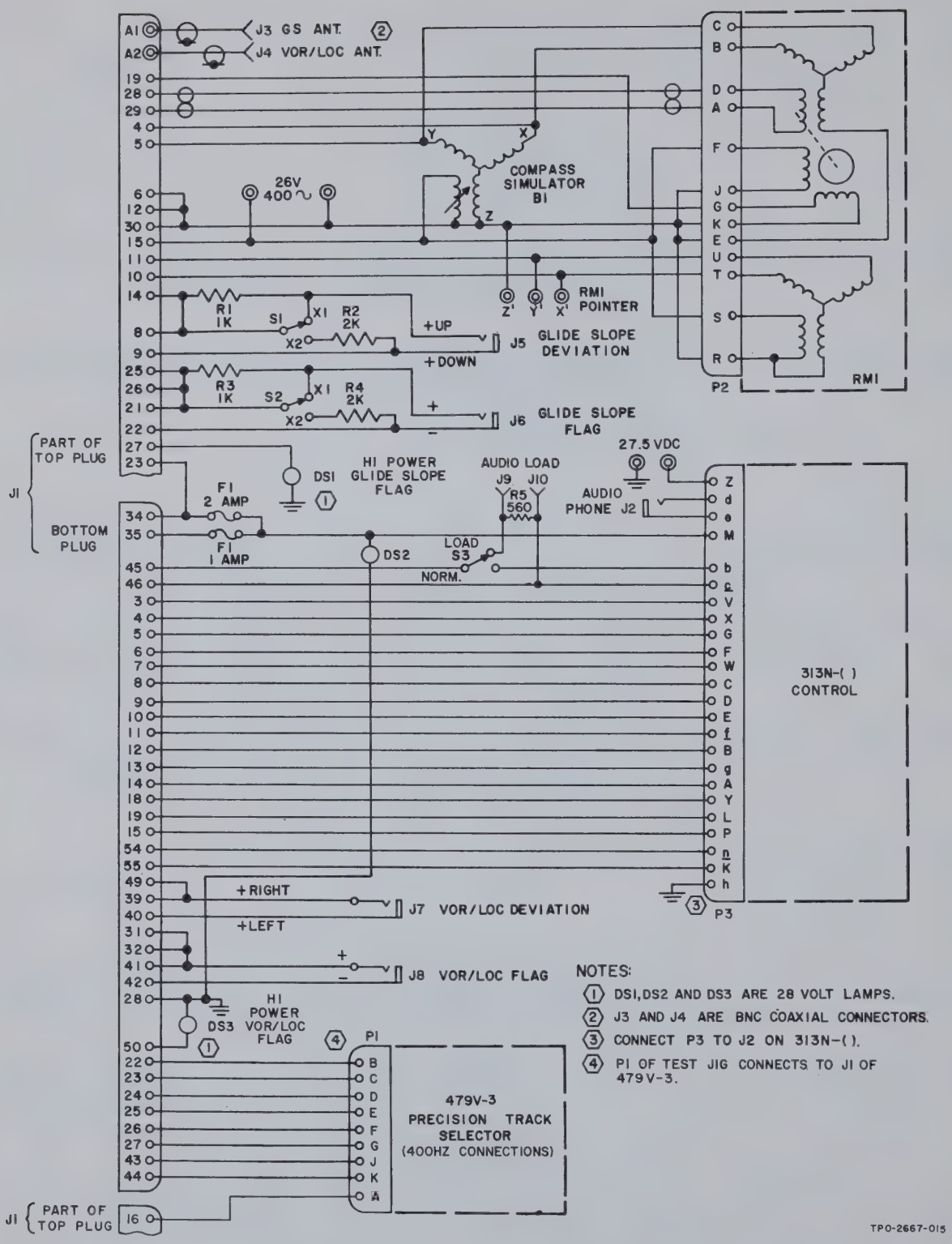
Test Equipment Required (Sheet 2 of 2)
Figure 1001

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
20-watt soldering iron	HEX-A-CON Model 25S or equivalent.	Remove/replace flatpacks and components.
Special solder tip	Fabricate per figure 1007.	Remove/replace flatpacks.
Metal tweezers	Clauss No. 231, Fremont, Ohio, or equivalent. Maximum jaw width is 0.030-inch.	Maneuver flatpack leads.

Repair Tools (Sheet 1 of 2)
Figure 1002

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Solder sucker	Soldapullit desoldering tool. Collins part no. 024-0675-001.	Used to remove solder.
Needle-nosed pliers	Vigor PL1406K or equivalent, modified per figure 1006	Bend flatpack and component leads
Cutting tools	Various; small diagonal cutter, end nippers, etc. (sharp tools that will not leave a burr)	Cut flatpack and component leads
Connector tools:		
Ⓐ Extraction tool	Cannon CET-FP (Collins part number 372-8091-020)	Aids in removing filter and ground contacts from Z1P1
Ⓑ Insertion tool	Cannon CIT-TF/FP (Collins part number 372-8091-060)	Aids in installing filter and ground contacts from Z1P1
Ⓒ Extraction tool	Cannon CET-C6B-1 (Collins part number 370-8040-030)	Aids in removing coaxial contacts from Z1P1
Ⓓ NOTE: Three separate tools are grouped together in Ⓓ		
Backup tool	Fabricate per figure 1008 (Collins part number 772-5936-010)	Used with impact tool to aid in removing contacts from Z1J2 and Z1J3.
Impact tool	Fabricate per figure 1008	Used with backup tool to aid in removing contacts from Z1J2 and Z1J3.
Insertion tool	Fabricate per figure 1008 (Collins part number 772-5938-001)	Used with backup tool to aid in inserting contacts into Z1J2 and Z1J3.

Repair Tools (Sheet 2 of 2)
Figure 1002



51RV-2B Test Jig, Schematic Diagram (Sheet 1 of 3)
Figure 1003

REFERENCE DESIGNATOR	COMPONENT	COLLINS PART NUMBER
B1	Synchro transmitter	229-0076-000
	Vernier dial for B1, Theta model DA-11-120	(Obtained from Theta Instrument Corp., 22 Spielman Road, Fairfield, New Jersey 07006)
DS1	Lamp, 28 volt (with socket)	
DS2	Lamp, 28 volt (with socket)	
DS3	Lamp, 28 volt (with socket)	
F1	Fuse, 2 A (with fuseholder)	
F2	Fuse, 1 A (with fuseholder)	
J1	Connector, Cannon part number DPX2-CA-32W2S57S-33B-0202	370-5229-00
	2 each coaxial inserts for J1, Cannon part number 249-1390-000	370-5224-00
J2	Jack, phone	358-1040-000
J3	Jack, BNC	357-9670-000
J4	Jack, BNC	357-9670-000
J5	Jack, phone	358-1040-000
J6	Jack, phone	358-1040-000
J7	Jack, phone	358-1040-000
J8	Jack, phone	358-1040-000
J9	Jack, Johnson DF-30	372-1062-000 (red)
J10	Jack, Johnson DF-30	372-1061-000 (blk)
Misc	7 each banana or tip jacks	
P1	Connector, Scintilla PT06A-14-19S	371-8087-00

51RV-2B Test Jig, Schematic Diagram (Sheet 2 of 3)
Figure 1003

REFERENCE DESIGNATOR	COMPONENT	COLLINS PART NUMBER
P2	Connector, Amphenol AN3106-22-14S	371-5018-00
P3	Connector, Scintilla PT06A-20-41S	371-6200-00
R1	Resistor, 1000 ohms, 1/4 w, 1%	705-6596-00
R2	Resistor, 2000 ohms, 1/4 w, 1%	705-6745-00
R3	Resistor, 1000 ohms, 1/4 w, 1%	705-6596-00
R4	Resistor, 2000 ohms. 1/4 w, 1%	705-6745-00
R5	Resistor, 560 ohms, 1 w, 10%	745-3342-00
S1	Switch, SPDT (on-on)	266-3067-000
S2	Switch, SPDT (on-on)	266-3067-000
Misc	Wire, #20 AWG Teflon	
Misc	RMI	
Misc	Control, Collins 313N-( )	

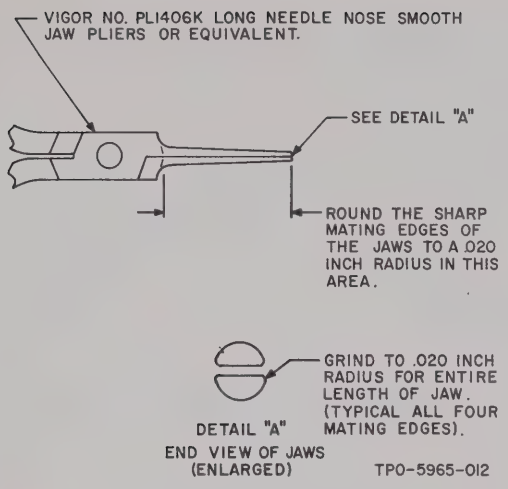
51RV-2B Test Jig, Schematic Diagram (Sheet 3 of 3)
Figure 1003

The extender cable for the 1051B-1 is listed in figure 1004. If an extender cable is fabricated, use the connectors listed in figure 1004. One-to-one wiring, approximately 2 feet long, is required between the connectors. The following groups of pins may be jumpered together at the connectors: 17, 18, 19, 20, 69, 70, 71, 72, and 74; 55, 56, 77, 78, 79, and 80 (one of these wires shall be shielded, with the shield connected to ground); 41, 42, 75, and 76; 44, 45, and 46; 47, 48, 49, and 50.

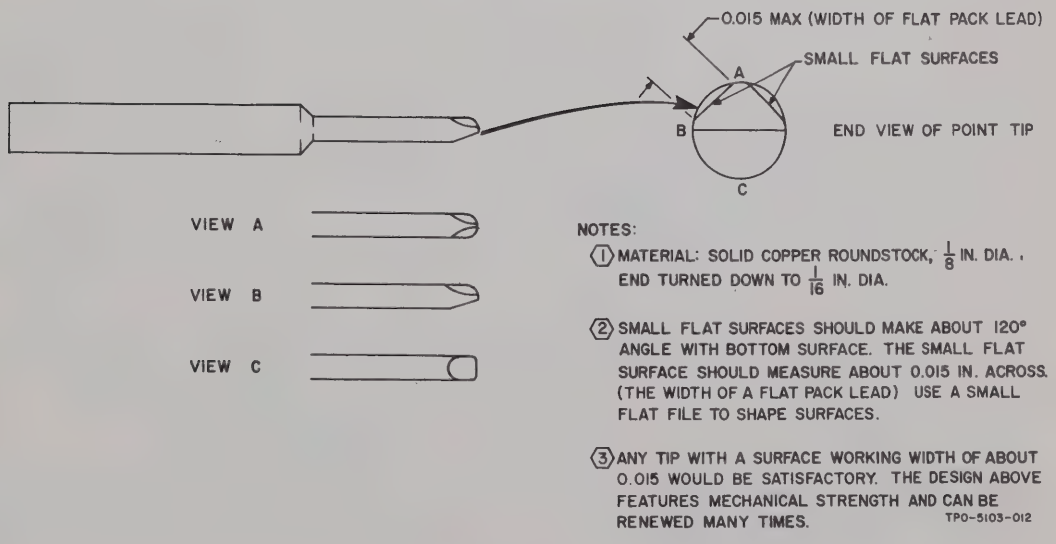
The coaxial inserts are for locations A1 and A2.

COLLINS PART NO	DESCRIPTION
791-0727-001	Extender cable assembly for 1051B-1
791-0735-001	Connector that mates with P1 on the 1051B-1
791-0739-001	Connector that mates with connector on 51RV-2B interconnect unit
372-2519-250	Coaxial inserts (2 required) for connector 791-0739-001
372-2519-240	Coaxial inserts (2 required) for connector 791-0735-001

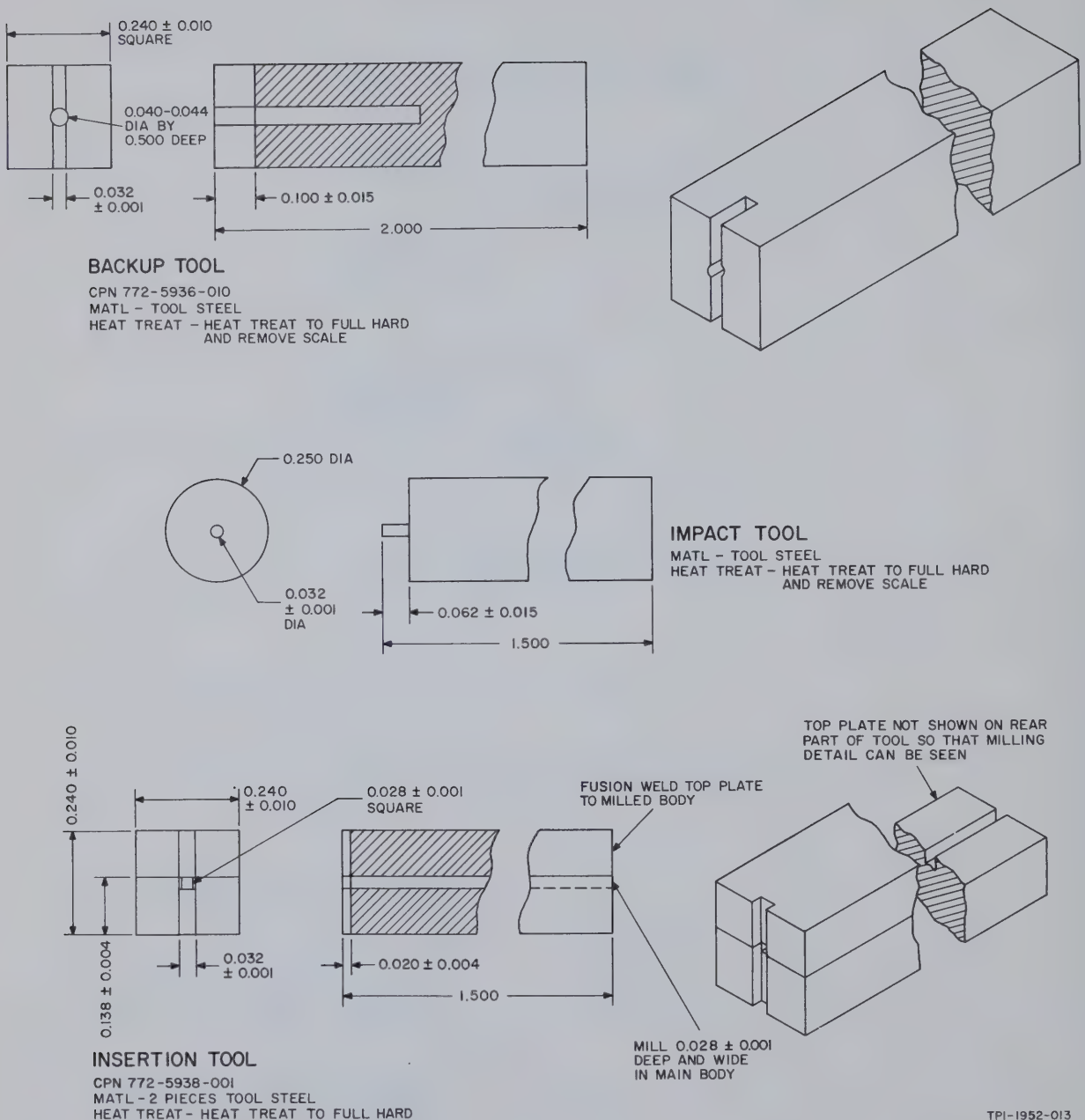
Extender Cables and Connectors
Figure 1004


VIGOR NO. PLI406K LONG NEEDLE NOSE SMOOTH JAW PLIERS OR EQUIVALENT.
SEE DETAIL "A"
ROUND THE SHARP MATING EDGES OF THE JAWS TO A .020 INCH RADIUS IN THIS AREA.
GRIND TO .020 INCH RADIUS FOR ENTIRE LENGTH OF JAW. (TYPICAL ALL FOUR MATING EDGES).
DETAIL "A"
END VIEW OF JAWS (ENLARGED)
TPO-5965-012

Modified Needle-Nosed Pliers
Figure 1006


0.015 MAX (WIDTH OF FLAT PACK LEAD)
SMALL FLAT SURFACES
A
B
C
END VIEW OF POINT TIP
VIEW A
VIEW B
VIEW C
NOTES:
1 MATERIAL: SOLID COPPER ROUNDSTOCK, 1/8 IN. DIA., END TURNED DOWN TO 1/16 IN. DIA.
2 SMALL FLAT SURFACES SHOULD MAKE ABOUT 120° ANGLE WITH BOTTOM SURFACE. THE SMALL FLAT SURFACE SHOULD MEASURE ABOUT 0.015 IN. ACROSS. (THE WIDTH OF A FLAT PACK LEAD) USE A SMALL FLAT FILE TO SHAPE SURFACES.
3 ANY TIP WITH A SURFACE WORKING WIDTH OF ABOUT 0.015 WOULD BE SATISFACTORY. THE DESIGN ABOVE FEATURES MECHANICAL STRENGTH AND CAN BE RENEWED MANY TIMES.
TPO-5103-012

Special Soldering Tip
Figure 1007



Impact, Backup, and Insertion Tools for Z1J2 and Z1J3 Contacts
Figure 1008

1051B-1 VHF NAV Receiver Planar Assembly - Illustrated Parts List

INTRODUCTION

1. GENERAL.

This Illustrated Parts List is a complete list of parts for the above equipment manufactured by Collins Radio Company (figure 1101).

The purpose of this Illustrated Parts List is for identification, requisitioning, and issuance of parts.

Collins Radio Company part numbering system is comprised of a 3-digit family number, a 4-digit serial number, and 2- or 3-digit dash number:

FAMILY NO	SERIAL NO	DASH NO
XXX	XXXX	XX or XXX

This Illustrated Parts List consists of four sections: Introduction, Numerical Index, Symbol Index, and Group Assembly Parts List.

If a part is purchased by Collins Radio Company from a vendor, the Federal Manufacturer's Code Number is listed in the nomenclature column. If this column does not include a Federal Manufacturer's Code Number, the item is either a MIL approved item, commercial item, or manufactured by Collins. Where COML appears in this column, the part may be obtained commercially from various vendors. Part numbers appearing in this column are Collins assigned part numbers for that item. Serial numbers or MCN (manufacturing control number) or CI (configuration identifier) effectivities, where applicable, are listed in this column. Serial number effectivities are designated on the nameplate. The MCN or CI is stamped on each module and/or chassis. Changes made from service bulletins are so indicated by SB1, SB2, etc.

2. MANUFACTURER'S CODE AND NAME INDEX.

CODE	MANUFACTURER'S NAME AND ADDRESS
00136	McCoy Electronics Co. Watts-Chestnut St. Mt. Holly Springs, PA 17065
00779	Amp, Inc. P.O. Box 3608 Harrisburg, PA 17100
01295	Texas Instruments, Inc. Semiconductor - Components Div. 13500 North Central Expressway Dallas, TX 75231
01526	General Electric Co. Specialty Control Dept. P.O. Box 812 Waynesboro, VA 22980

CODE	MANUFACTURER'S NAME AND ADDRESS
01939	Sprague Electric Co. of Wisconsin Grafton, WI 53024
03038	Long-Lok Corp. 4101 Redwood Ave. Los Angeles, CA 90096
04713	Motorola Semiconductor Products, Inc. 5005 East McDowell Rd. Phoenix, AZ 85008
06668	Texas Instruments, Inc. Industrial Products Group 3609 Buffalo Speedway P.O. Box 66027 Houston, TX 77006
07263	Fairchild Camera and Instrument Corp. Semiconductor Div. 313 Bayshore Frontage Rd. Mountain View, CA 94040
07707	United Shoe Machinery Corp. Fastener Div. 510 River Rd. Shelton, CT 06485
08289	Blinn, Delbert, Co., Inc., The 1678 E. 5th Ave. Pomona, CA 91769
10646	Carborundum Co. Buffalo Ave. Niagara Falls, NY 14302
12615	U.S. Terminals, Inc. 7504 Camargo Cincinnati, OH 45243
13103	Thermaloy Co. 8717 Diplomacy Row Dallas, TX 75247
13327	Solitron Devices, Inc. Oak Tree Rd. Tappan, NY 10983
14953	Inland Electronic Products Corp. 323 Washington Blvd. Pasadena, CA 91104
15909	Daven Div., Thomas A. Edison Industries McGraw Edison Co. 530 W. Mt. Pleasant Ave. Livingston, NJ 07039
19080	Robison Co., The 3636-5 West 139th St. Hawthorne, CA 90250
56289	Sprague Electric Co. 479 Marshall St. North Adams, MA 01247
70674	ADC Products, Inc. 6405 Cambridge St. Minneapolis, MN 55426
71468	ITT Cannon Electric, Inc. 3208 Humboldt St. Los Angeles, CA 90031
71590	Centralab, Div. of Globe-Union, Inc. 932 E. Keefe Ave. Milwaukee, WI 53212
72136	Electro Motive Mfg. Co., Inc., The S. Park and John Sts. Willimantic, CT 06226
72962	Elastic Stop Nut Corp. of America 2330 Vauxhall Rd. Union, NJ 07083
72982	Erie Technological Products, Inc. 644 W. 12th St. Erie, PA 16512
73899	J. F. D. Electronics Corp. 15th at 62nd St. Brooklyn, NY 11220
74970	Johnson, E. F., Co. 297 10th Ave. S.W. Waseca, MN 56093

CODE	MANUFACTURER'S NAME AND ADDRESS
76854	Oak Mfg. Co. S. Main Crystal Lake, IL 60014
77147	Patton MacGuyer Co. Edgewood Station Providence, RI 02905
77250	Pheoll Mfg. Co. 5700 Roosevelt Rd. Chicago, IL 60650
78189	Shakeproof Div. of Illinois Tool Works, Inc. St. Charles Rd. Elgin, IL 60120
80205	National Aerospace Standards Committee Aeronautical Industries Association of America Washington, DC
80223	United Transformer Co. 150 Varick St. New York, NY 10013
80294	Bourns, Inc. 6135 Magnolia Ave. Riverside, CA 92506
81073	Grayhill, Inc. 531 Hillgrove LaGrange, IL 60525
81815	Communications Coil Co. 2832 N. Narragansett Chicago, IL 60634
86335	Glenco Corp. 212 Durham Ave. Metuchen, NJ 08841
86577	Precision Metal Products of Malden, Inc. 41 Elm St. Stoneham, MA 02180
86928	Seastrom Mfg. Co. 703 Sonora Ave. Glendale, CA 91201
90030	United Shoe Machinery Corp. Balch St. Beverly, MA 01915
90634	Gulton Industries, Inc. Gulton St. Metuchen, NJ 08840
91293	Johanson Mfg. Co. P.O. Box 329 Boonton, NJ 07005
91637	Dale Electronics, Inc. P.O. Box 609 Columbus, NB 68601
93332	Giannini Control Corp. New Jersey Div. Sherwood Lane Fairfield, NJ 07007
94148	Scientific Electronic Products, Inc. 2303 W. 8th St. Loveland, CO 80537
95105	Collins Radio Co. Information Science Center 19700 San Joaquin Rd. P.O. Box C Newport Beach, CA 92663
95987	Weckesser Co., Inc. 4444 West Irving Park Rd. Chicago, IL 60641
96341	Microwave Associates, Inc. South Ave. Burlington, MA 01801
98291	Sealectro Corp. 225 Hoyt Mamaroneck, NY 10544

CODE	MANUFACTURER'S NAME AND ADDRESS
98978	International Electronic Research Corp. 151 W. Magnolia Ave. Burbank, CA 91502
99378	Atlee Corp. 2 Lowell Ave. Winchester, MA 01890
99800	Delevan Electronic Corp. 270 Quaker Rd. East Aurora, NY 14052

3. TABLE I.

A. Usage Code

The following codes have been assigned in this manual:

USAGE CODE	UNIT	FIGURE
A	1051B-1 VHF NAV Receiver Planar Assembly CPN 772-0790-001	1101
B	1051B-1 VHF NAV Receiver Planar Assembly CPN 772-0790-003	1101

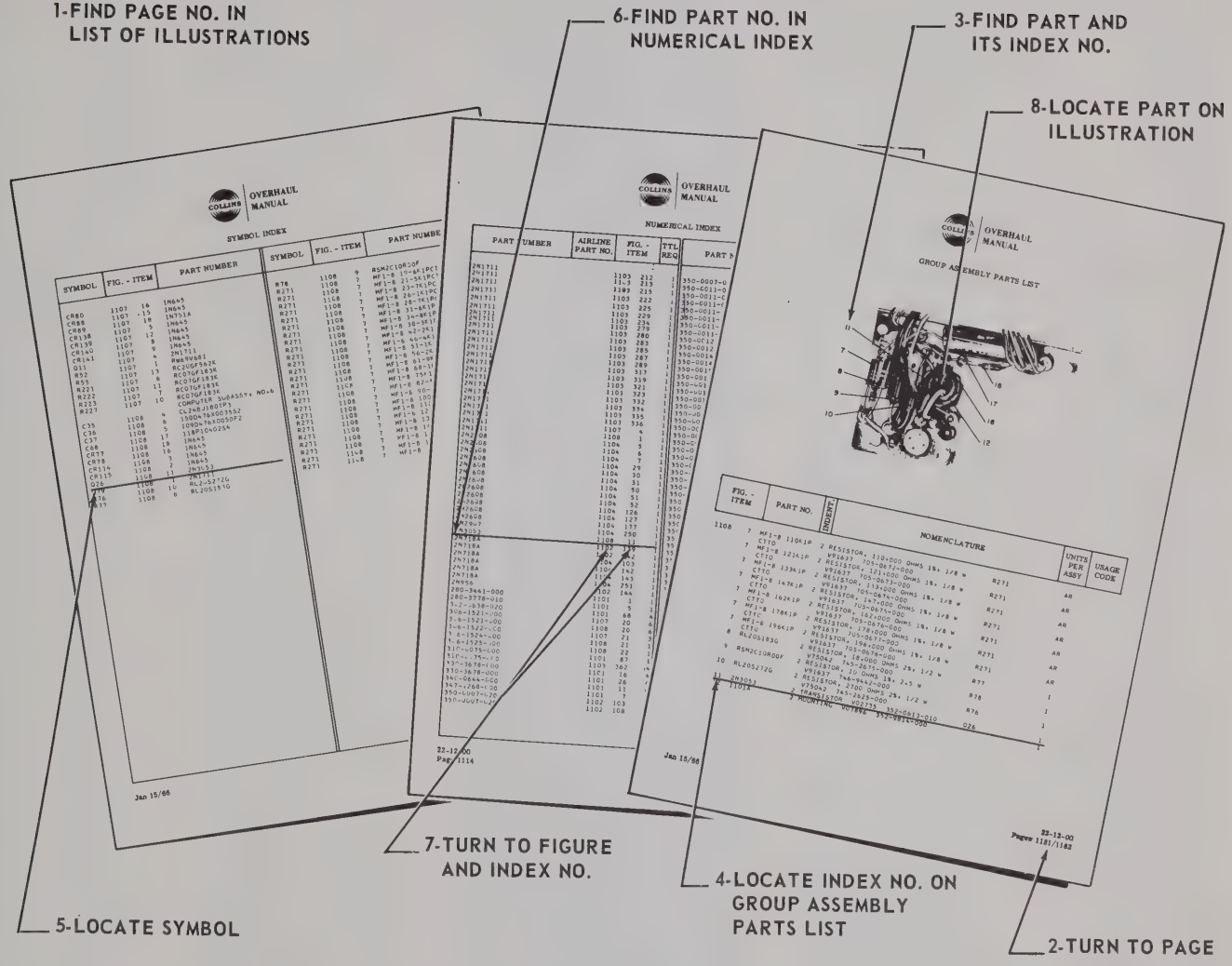
B. Reference Designation Prefixes.

The following prefixes have been assigned in this manual:

PREFIX		FIGURE
Z1	Receiver Board	1107
Z2	Test Generator	1105
Z3	500 kHz IF	1108
Z4	Card Servo	1109
Z5	Audio Section of Receiver Board	1110
Z6	Power Supply	1111
Z7	8 MHz IF	1102
Z8	Tuner	1103
Z9	Test Oscillator	1104

INTRODUCTION

How to Use This Illustrated Parts List


1-FIND PAGE NO. IN LIST OF ILLUSTRATIONS
6-FIND PART NO. IN NUMERICAL INDEX
3-FIND PART AND ITS INDEX NO.
8-LOCATE PART ON ILLUSTRATION
7-TURN TO FIGURE AND INDEX NO.
4-LOCATE INDEX NO. ON GROUP ASSEMBLY PARTS LIST
5-LOCATE SYMBOL
2-TURN TO PAGE

HOW TO FIND THE PART NUMBER IF THE SECTION OR SYSTEM OF THE EQUIPMENT IN WHICH THE PART IS USED IS KNOWN:

(1) Turn to the List of Illustrations and find the page number for the Major Assembly or System in which the part is used.

(2) Turn to the page determined in step (1).

(3) Locate the part and its index number on the illustration.

(4) Find the index number on the Group Assembly Parts List page to determine complete description.

(5) If the reference designation symbol is known, refer to the Symbol Index to find the part number.

HOW TO FIND THE ILLUSTRATION FOR A PART IF THE PART NUMBER IS KNOWN:

(6) Refer to the Numerical Index and find the part number.

(7) Turn to the Group Assembly Parts List and find the first figure and index number indicated in the Numerical Index for that part. If this figure shows the part in a section or system of the equipment other than the one desired, refer to the other figure numbers listed in the Numerical Index.

(8) On the face of the illustration, find the index number determined in step (7).

NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
AB404D	1102- 75	2	
AB404D	1104- 29	2	
AB406D	1102- 78	6	
AB406D	1103- 94	4	
AB406D	1104- 32	1	
A101	1108- 52	1	
A102	1101- 1	1	
A105	1103- 23	1	
A110	1102- 55	1	
A110	1103- 42	1	
A17030	1111- 65	1	
CK12AX102M	1102- 56	1	
CK12AX102M	1103- 54	1	
CK12AX102M	1103- 57	1	
CK12AX102M	1103- 72	1	
CK12AX102M	1103- 86	1	
CK12AX102M	1104- 10	1	
CK15M103M	1102- 46	1	
CK15M122M	1102- 32	1	
CK15M472M	1111- 5	1	
CK16M104M	1102- 13	1	
CK16M104M	1102- 14	1	
CK16M104M	1102- 23	1	
CK16M104M	1102- 38	1	
CK16M104M	1102- 39	1	
CK16M104M	1102- 40	1	
CK16M104M	1102- 45	1	
CK16M104M	1102- 47	1	
CK16M104M	1102- 50	1	
CK16M104M	1108- 19	1	
CK16M104M	1108- 58	1	
CK16M104M	111 - 31A	1	
CK46M104K	1101- 29	1	
CM04FD271J03	1104- 6	1	
CM06FD432G03	1105- 77	1	
CM06FD432G03	1105- 78	1	
CS13BC336M	1111- 38	1	
CS13BD226M	1111- 36	1	
CS12BF685M	1111- 31	1	
CT14-223K	1111- 27	1	
C1514	1111- 52	1	
DM10C030D0	1102- 60A	1	
DA718-001	1104- 3	1	
DA718-001	1104- 4	1	
DA718-001	1104- 14	1	
DM10C050J	1103- 16	1	
DM10E220J	1104- 7	1	
DM10E300J	1103- 12	1	
DM10E330J	1102- 6	1	
DM10F101J	1103- 14	1	
DM10F151J	1108- 44	1	
DM10F151J	1108- 45	1	
DM10F221J	1102- 9	1	
DM10F221J	1104- 20	1	
DM10F560J	1104- 16	1	
DM15F511K03	1104- 15	1	
D41822	1107- 16	1	
D6729	1102- 62	1	
F22NCFMA1-26	1102- 74	3	
G2-220PORM1PCTV	1111- 30	1	
H25	1106- 29	1	
H25	1106- 36	1	

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
H25	1108- 70	2	
JAN1N746A	1105- 26	1	
JAN1N746A	1105- 82	1	
JMC2903	1103- 56	1	
JMC2903	1103- 71	1	
JMC2903	1103- 85	1	
KL697	1110- 27	1	
MA4394	1103- 55	1	
MA4394	1103- 69	1	
MA4394	1103- 70	1	
MA4394	1103- 83	1	
MA4394	1103- 84	1	
MF1-10 13300F	1105- 24	1	
MF1-10 16202F	1105-116	1	
MF1-10 39200FT1	1105- 2	1	
MM2187	1106- 25	1	
MS16535-22	1107- 18	4	
MS16535-51	1102- 2	1	
MS16535-54	1107- 11	2	
MS16535-75	1104- 25	1	
MS18130-10	1103- 49	1	
MS35338-134	1102- 77	2	
MS35338-134	1102- 80	7	
MS35338-134	1103- 96	4	
MS35338-134	1104- 31	2	
MS35338-134	1104- 34	1	
MS35338-136	1107- 7	3	
MS35649-24	1102- 76	2	
MS35649-24	1103- 19	1	
MS35649-24	1103- 25	1	
MS35649-24	1103- 95	4	
MS35649-24	1104- 30	2	
MS35649-24	1104- 33	1	
MS51957-2	1103- 68	1	
MS51957-2	1103- 82	1	
MS51957-2	1105- 22	2	
MS51957-3	1103- 53	3	
MS51957-28	1106- 16	2	
MS51957-28	1106- 24	2	
MS51957-5	1108- 72	4	
MS90539-08	1107- 14	1	
MS90539-08	1108- 54	1	
MS90539-15	1103- 35	1	
MW265-90	1106- 28	2	
MW375-140	1106- 12	2	
MW375-140	1106- 21	2	
MW406-95	1101- 37	2	
MW406-95	1106- 4	1	
MW406-95	1106- 7	1	
MW406-95	1106- 42	1	
NAS1190C04P3	1110- 29	2	
NS3001	1111- 7	1	
NS3001	1111- 8	1	
NS3001	1111- 63	1	
N256	1103- 27	1	
P313-0005-000	1106- 34	1	
P313-0045-000	1106- 10	2	
P313-0045-000	1106- 19	2	
P313-0045-000	1107- 6	3	
P313-0484-000	1102- 79	7	
P313-0484-010	1106- 30	2	
P313-0484-010	1106- 37	2	

NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
P313-0484-010	1108- 71	4	
P330-1669-170	1107- 9	3	
P330-2247-000	1103- 21	1	
P330-2287-000	1106- 31	2	
P330-2287-000	1106- 38	2	
P334-0265-000	1101- 24	1	
P342-1359-010	1105- 8	2	
P343-0465-000	1105- 7	6	
RCRP800060-2A	1107- 46	1	
RC07GF100K	1108- 10	1	
RC07GF100K	1109- 25	1	
RC07GF100K	1109- 26	1	
RC07GF100K	1110- 10	1	
RC07GF101K	1102- 25	1	
RC07GF101K	1108- 3	1	
RC07GF101K	1108- 16	1	
RC07GF101K	1108- 66	1	
RC07GF101K	1110- 7	1	
RC07GF102K	1102- 17	1	
RC07GF102K	1102- 27	1	
RC07GF102K	1103- 7	1	
RC07GF102K	1105-130	1	
RC07GF102K	1107- 13	1	
RC07GF102K	1108- 11	1	
RC07GF102K	1108- 38	1	
RC07GF102K	1108- 76	1	
RC07GF102K	1108- 78	1	
RC07GF102K	1110- 45	1	
RC07GF102K	1111- 29	1	
RC07GF102K	1111- 43	1	
RC07GF103K	1101- 17A	AR	
RC07GF103K	1102- 36	1	
RC07GF103K	1102- 37	1	
RC07GF103K	1104- 21	1	
RC07GF103K	1105- 53	1	
RC07GF103K	1105- 55	1	
RC07GF103K	1105- 60	1	
RC07GF103K	1105- 61	1	
RC07GF103K	1105- 66	1	
RC07GF103K	1105- 96	1	
RC07GF103K	1105-100	1	
RC07GF103K	1105-106	1	
RC07GF103K	1105-113	1	
RC07GF103K	1105-125	1	
RC07GF103K	1105-127	1	
RC07GF103K	1105-134	1	
RC07GF103K	1107- 23	1	
RC07GF103K	1107- 25	1	
RC07GF103K	1110- 51	1	
RC07GF103K	1110- 52	1	
RC07GF104K	1103- 58	1	
RC07GF104K	1103- 73	1	
RC07GF104K	1103- 87	1	
RC07GF104K	1105-114	1	
RC07GF121K	1103- 33	1	
RC07GF121K	1110- 12	1	
RC07GF122J	1108- 18	1	
RC07GF122K	1102- 18	1	
RC07GF122K	1104- 5	1	
RC07GF122K	1108- 15	1	
RC07GF122K	1111- 22	1	
RC07GF122K	1111- 54	1	

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
RC07GF123K	1101- 17A	AR	
RC07GF123K	1103- 13	1	
RC07GF123K	1105-140	1	
RC07GF123K	1108- 39	1	
RC07GF150K	1108- 29	1	
RC07GF150K	1108- 30	1	
RC07GF150K	1109- 15	1	
RC07GF150K	1109- 17	1	
RC07GF151J	1103- 11	AR	
RC07GF151K	1108- 34	1	
RC07GF151K	1110- 9	1	
RC07GF152J	1108- 9	1	
RC07GF152K	1102- 16	1	
RC07GF152K	1108- 64	1	
RC07GF152K	1108- 65	1	
RC07GF152K	1111- 59	1	
RC07GF153K	1101- 17A	AR	
RC07GF153K	1105- 98	1	
RC07GF153K	1105-107	1	
RC07GF153K	1105-109	1	
RC07GF153K	1105-126	1	
RC07GF154K	1105-102	1	
RC07GF154K	1105-103	1	
RC07GF161J	1103- 11	AR	
RC07GF180K	1111- 67	1	
RC07GF180K	1111- 68	1	
RC07GF181J	1103- 11	AR	
RC07GF182K	1102- 48	1	
RC07GF182K	1104- 9	1	
RC07GF182K	1105-129	1	
RC07GF182K	1108- 4	1	
RC07GF182K	1109- 5	1	
RC07GF183K	1101- 17A	AR	
RC07GF201J	1103- 11	AR	
RC07GF220K	1111- 28	1	
RC07GF221J	1103- 11	AR	
RC07GF221K	1103- 8	1	
RC07GF221K	1103- 32	1	
RC07GF221K	1111- 34	1	
RC07GF221K	1111- 35	1	
RC07GF222K	1102- 70	1	
RC07GF222K	1105- 79	1	
RC07GF222K	1105- 80	1	
RC07GF222K	1105- 83	1	
RC07GF222K	1105- 84	1	
RC07GF222K	1107- 33	1	
RC07GF222K	1111- 48	1	
RC07GF223K	1101- 17A	AR	
RC07GF223K	1103- 47	1	
RC07GF223K	1103- 48	1	
RC07GF223K	1105-110	1	
RC07GF223K	1105-121	1	
RC07GF223K	1105-124	1	
RC07GF223K	1107- 27A	1	
RC07GF223K	1108- 46	1	
RC07GF241J	1103- 11	AR	
RC07GF271J	1103- 11	AR	
RC07GF271K	1105- 27	1	
RC07GF271K	1109- 3	1	
RC07GF272K	1105- 62	1	
RC07GF272K	1105- 70	1	
RC07GF272K	1107- 42	1	

NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
RC07GF272K	1108- 26	1	
RC07GF272K	1108- 33	1	
RC07GF272K	1109- 4	1	
RC07GF273K	1101- 17A	AR	
RC07GF273K	1105- 46	1	
RC07GF273K	1110- 3	1	
RC07GF301J	1103- 11	AR	
RC07GF331J	1103- 11	AR	
RC07GF331K	1105-150	1	
RC07GF331K	1105-151	1	
RC07GF331K	1105-152	1	
RC07GF332K	1105-128	1	
RC07GF332K	1107- 39	1	
RC07GF332K	1107- 40	1	
RC07GF332K	1107- 41	1	
RC07GF332K	1109- 29	1	
RC07GF332K	1109- 30	1	
RC07GF332K	1110- 22	1	
RC07GF332K	1110- 23	1	
RC07GF332K	1110- 43	1	
RC07GF333K	1101- 17A	AR	
RC07GF333K	1104- 8	1	
RC07GF333K	1108- 59	1	
RC07GF361J	1103- 11	AR	
RC07GF390K	1103- 34	1	
RC07GF391J	1103- 11	AR	
RC07GF391K	1102- 43	1	
RC07GF391K	1109- 32	1	
RC07GF391K	1110- 19	1	
RC07GF391K	1110- 20	1	
RC07GF392K	1102- 51	1	
RC07GF392K	1105- 49	1	
RC07GF393K	1101- 17A	AR	
RC07GF431J	1103- 11	AR	
RC07GF470K	1102- 15	1	
RC07GF470K	1102- 31	1	
RC07GF470K	1108- 5	1	
RC07GF470K	1108- 63	1	
RC07GF470K	1108- 79	1	
RC07GF470K	1111- 3	1	
RC07GF471J	1103- 11	AR	
RC07GF471K	1102- 54	1	
RC07GF471K	1105- 69	1	
RC07GF471K	1105- 72	1	
RC07GF471K	1108- 62	1	
RC07GF471K	1108- 67	1	
RC07GF471K	1110- 2	1	
RC07GF471K	1110- 34	1	
RC07GF471K	1110- 41	1	
RC07GF471K	1111- 16	1	
RC07GF472K	1102- 12	1	
RC07GF472K	1102- 41	1	
RC07GF472K	1102- 42	1	
RC07GF472K	1102- 61	1	
RC07GF472K	1105- 68	1	
RC07GF472K	1105- 71	1	
RC07GF472K	1107- 19	1	
RC07GF472K	1107- 24	1	
RC07GF472K	1109- 28	1	
RC07GF472K	1109- 31	1	
RC07GF472K	1110- 6	1	
RC07GF472K	1110- 11	1	

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
RC07GF472K	1110- 14	1	
RC07GF473K	1107- 22	1	
RC07GF560K	1111- 14	1	
RC07GF562J	1110- 21	1	
RC07GF562K	1102- 8	1	
RC07GF562K	1102- 35	1	
RC07GF562K	1102- 64	1	
RC07GF562K	1104- 12	1	
RC07GF562K	1104- 18	1	
RC07GF562K	1107- 29	1	
RC07GF562K	1111- 2	1	
RC07GF562K	1111- 18	1	
RC07GF563K	1103- 17	1	
RC07GF563K	1108- 35	1	
RC07GF563K	1111- 15	1	
RC07GF680K	1105- 81	1	
RC07GF681K	1110- 44	1	
RC07GF681K	1110- 46	1	
RC07GF681K	1111- 32	1	
RC07GF682K	1105- 33	1	
RC07GF820K	1109- 6	1	
RC07GF820K	1109- 7	1	
RC07GF821K	1111- 17	1	
RC07GF822K	1105- 97	1	
RC07GF823K	1104- 11	1	
RC07GF823K	1110- 58	1	
RC20GF102K	1105-168	1	
RC20GF220K	1110- 48	1	
RC20GF222K	1111- 19	1	
RC20GF331K	1109- 22	1	
RC20GF391K	1110- 13	1	
RC20GF821K	1110- 47	1	
RG196AU	1103- 3	AR	
RN55D1002F	1105- 89	1	
RN55D1002F	1105-157	1	
RN55D1002F	1105-161	1	
RN55D1211F	1105- 87	1	
RN55D1331F	1105- 48	1	
RN55D1332F	1105- 36	1	
RN55D1332F	1105- 40	1	
RN55D1471F	1105-162	1	
RN55D1622F	1102- 52	1	
RN55D1782F	1105-169	1	
RN55D2151F	1105-170	1	
RN55D2152F	1107- 32	1	
RN55D2153F	1108- 27	1	
RN55D2611F	1105-163	1	
RN55D3651F	1102- 52	1	
RN55D4641F	1105- 50	1	
RN55D4642F	1108- 51	1	
RN55D5111F	1105- 37	1	
RN55D5111F	1105- 38	1	
RN55D5111F	1105- 39	1	
RN55D5111F	1105- 42	1	
RN55D5112F	1105-137	1	
RN55D5621F	1105- 41	1	
RN55D5621F	1105- 43	1	
RN55D6812F	1108- 28	1	
RN55D7500F	1108- 31	1	
RN55D9091F	1102- 57	1	
RN55D9092F	1105-118	1	
RN60C1001F	1105- 29	1	

NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
RN60C1001F	1111- 46	1	
RN60C1002F	1105- 3	1	
RN60C1002F	1105- 23	1	
RN60C1101F	1111- 56	1	
RN60C1212F	1105- 34	1	
RN60C1212F	1105- 35	1	
RN60C3830F	1105- 30	1	
RN60C4221F	1105-164	1	
RN60C5620F	1111- 33	1	
RN60C5620F	1111- 55	1	
RN60D1001F	1105-159	1	
RN60D1001F	1105-160	1	
RN60D1001F	1105-165	1	
RS200BR3300F	1111- 50	1	
RW69V100	1110- 26	1	
RW69V100	1110- 30	1	
RW69V4R7	1111- 9	1	
RW69V821	1111- 62	1	
RW69V820	1110- 5	1	
SE24CADPL	1103- 63	2	
SE24CADPL	1103- 78	2	
SE24CADPL	1103- 92	2	
SE43CADPL	1103- 99	1	
SF31	1105-144	1	
SG141	1105-147	1	
SG41	1105-141	1	
SJ1391	1106- 8	1	
SL157-197	1103- 97	9	
SL157-197	1106- 45	2	
SL158-198	1103- 98	8	
SL158-198	1104- 28	1	
SL158-198	1106- 44	7	
SL180-231	1102- 81	18	
SL283-230	1102- 82	23	
SL283-230	1104- 27	6	
SL283-230	1106- 47	1	
SL324-231	1103- 60	1	
SL324-231	1103- 75	1	
SL324-231	1103- 89	1	
SL324-231	1104- 26	3	
S21825	1106- 40	1	
S289-1585-000	1104- 23	1	
S289-7024-010	1102- 5	1	
TA2402A	1106- 13	1	
TC20-101	1103- 15	1	
TF4SX13YY	1109- 13	1	
TF4SX13YY	1109- 33	1	
TM1-8 1000-10	1111- 49	1	
TR108	1105-132	1	
TR118	1108- 57	1	
TW140-210-035	1106- 14	2	
TW140-210-035	1106- 22	2	
TXB2-032-037B	1106- 2	1	
TXB2P019-028B	1106- 6	1	
TXB2P019-028B	1106- 27	2	
TXB2P019-028B	1106- 41	1	
TXB2P032-037-3B	1101- 36	2	
VC21GY	1102- 65	1	
VC21GY	1103- 38	1	
XB021767-3	1104- 22A	1	
XB021767-3	1106- 31A	1	
031-1066-000	1103- 4	1	

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
031-1066-001	1103- 2	1	
1N3024B	1111- 61	1	
1N3030B	1109- 23	1	
1N3064	1108- 43	1	
1N3064	1108- 47	1	
1N3064	1108- 49	1	
1N3064	1108- 50	1	
1N3338B	1106- 33	1	
1N4002	1106- 35	1	
1N457	1102- 73	1	
1N629	1111- 20	1	
1N645	1105- 4	1	
1N645	1105- 5	1	
1N645	1105- 31	1	
1N645	1105- 32	1	
1N645	1105- 44	1	
1N645	1105- 45	1	
1N645	1105- 51	1	
1N645	1105- 52	1	
1N645	1105- 56	1	
1N645	1105- 57	1	
1N645	1105- 58	1	
1N645	1105- 59	1	
1N645	1105- 63	1	
1N645	1105- 67	1	
1N645	1105- 73	1	
1N645	1105- 74	1	
1N645	1105- 88	1	
1N645	1105- 92	1	
1N645	1105- 94	1	
1N645	1105- 95	1	
1N645	1105- 99	1	
1N645	1105-101	1	
1N645	1105-108	1	
1N645	1105-115	1	
1N645	1105-119	1	
1N645	1105-120	1	
1N645	1105-156	1	
1N645	1105-158	1	
1N645	1107- 26	1	
1N645	1107- 27	1	
1N645	1107- 28	1	
1N645	1107- 31	1	
1N645	1107- 34	1	
1N645	1107- 36	1	
1N645	1107- 37	1	
1N645	1111- 66	1	
1N645	1111- 21	1	
1N645	1111- 25	1	
1N645	1111- 26	1	
1N645	1111- 40	1	
1N645	1111- 41	1	
1N746A	1102- 49	1	
1N751A	1107- 38	1	
1N751A	1111- 47	1	
1N753A	1111- 42	1	
1N753A	1111- 51	1	
1N754A	1105-117	1	
1N755A	1108- 42	1	
1N758A	1107- 30	1	
1N914	1105-139	1	
1N962B	1102- 44	1	

NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
1P4-26A	1106- 43	5	
100-200-14-7	1107- 10	2	
1025-04	1103- 36	1	
1025-30	1102- 30	1	
1025-30	1103- 28	1	
1025-34	1104- 17	1	
1025-48	1102- 63	1	
1025-62	1102- 7	1	
1025-62	1102- 24	1	
1025-62	1102- 53	1	
1025-62	1103- 5	1	
1025-62	1104- 2	1	
105-0754-150	1108- 77	1	
105-0758-150	1109- 1	1	
105-0760-150	1108- 68	1	
105-0762-150	1109- 35	1	
109D187X9025T2	1105-149	1	
109D187X0025T2	1111- 44	1	
109D686X0030F2	1105-112	1	
130D826X0030T2	1111- 37	1	
130D826X0030T2	1111- 1	1	
150D105X0035A2	1110- 18	1	
150D105X0035A2	1110- 33	1	
150D105X0035A2	1110- 35	1	
150D106X0020B2	1108- 55	1	
150D106X0020B2	1110- 42	1	
150D106X0020B2	1110- 57	1	
150D157X0015S2	1107- 35	1	
150D1696	1103- 43	1	
150D225X0020A2	1102- 11	1	
150D225X0020A2	1108- 6	1	
150D225X0020A2	1108- 8	1	
150D225X0020A2	1108- 61	1	
150D225X9035B2	1109- 24	1	
150D227X0010S2	1101- 39	1	
150D227X0010S2	1111- 64	1	
150D277X9015S2	1108- 25	1	
150D334X0035A2	1110- 53	1	
150D336X0010B2	1105- 91	1	
150D336X0020R2	1108- 20	1	
150D336X0035S2	1110- 4	1	
150D337X0006S2	1110- 8	1	
150D473X0035A2	1109- 12	1	
150D473X0035A2	1109- 14	1	
150D473X0035A2	1109- 16	1	
150D473X0035A2	1109- 27	1	
150D475X0010A2	1108- 32	1	
150D475X0035B2	1105- 90	1	
150D475X0035B2	1105-111	1	
150D476X0006B2	1110- 15	1	
150D476X0020R2	1107- 15	1	
150D476X0035S2	1108- 60	1	
150D476X0035S2	1110- 1	1	
150D685X0006A2	1104- 1	1	
151D115X9020W2	1109- 34	1	
151D116X9015X2	1105- 54	1	
1810-00	1101- 25	1	
19C372	1103- 31	1	
19C372	1103- 37	1	
19C372	1103- 44	1	
19C372	1103- 45	1	
19C372	1103- 46	1	

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
192P1039R8	1102- 26	1	
192P1039R8	1102- 28	1	
192P1039R8	1102- 71	1	
192P1039R8	1108- 14	1	
192P1039R8	1110- 32	1	
192P1039R8	1110- 56	1	
192P1049R8	1103- 6	1	
192P1049R8	1103- 10	1	
192P1049R8	1108- 1	1	
192P1049R8	1108- 2	1	
192P1049R8	1108- 7	1	
192P1049R8	1108- 12	1	
192P1049R8	1108- 21	1	
192P1049R8	1108- 48	1	
192P1049R8	1108- 69	1	
192P1229R8	1102- 32	1	
192P2249R8	1105- 25	1	
192P3329R8	1102- 34	1	
192P47192	1105-136	1	
192P4739R8	1105-166	1	
192P4739R8	1105-167	1	
192P4739R8	1109- 2	1	
2B55	1101- 12	1	
2C067103X0101A3	1102- 26	1	
2C067103X0101A3	1102- 28	1	
2C067104X0101A3	1101- 38	1	
2C067104X0101A3	1105-135	1	
2C067104X0101A3	1111- 12	1	
2C067104X0101A3	1111- 13	1	
2C067104X0101A3	1111- 45	1	
2C067332X0101A3	1102- 34	1	
2N1711	1107- 43	1	
2N1711	1109- 18	1	
2N1711	1109- 20	1	
2N2405	1101- 34	1	
2N2405	1101- 35	1	
2N2907A	1105- 75	1	
2N2907A	1105- 76	1	
2N2907A	1105- 93	1	
2N2907A	1105-105	1	
2N2907A	1105-123	1	
2N2907A	1105-131	1	
2N2907A	1108- 40	1	
2N2907A	1111- 39	1	
2N2907A	1111- 58	1	
2N3011	1108- 56	1	
2N3054	1106- 17	1	
2N3337	1102- 19	1	
2N3337	1108- 13	1	
2N3337	1108- 75	1	
2N3440	1111- 24	1	
2N3440	1111- 60	1	
2N3700	1110- 24	1	
2N3700	1110- 36	1	
2N3823	1102- 21	1	
2N3904	1105- 85	1	
2N3904	1105- 86	1	
2N4029	1111- 57	1	
2N4226	1106- 1	1	
2N4226	1106- 5	1	
2N4416	1103- 29	1	
2N4416	1103- 30	1	

NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
2N918	1102- 10	1	
2N918	1102- 29	1	
2N918	1104- 13	1	
2N918	1104- 22	1	
2N930	1108- 41	1	
2N956	1105- 28	1	
2N956	1105- 47	1	
2N956	1105- 64	1	
2N956	1105- 65	1	
2N956	1105-104	1	
2N956	1105-122	1	
2N956	1105-133	1	
2N956	1105-153	1	
2N956	1105-154	1	
2N956	1105-155	1	
2N956	1106- 26	1	
2N956	1107- 20	1	
2N956	1107- 21	1	
2N956	1107- 27B	1	
2N956	1107- 44	1	
2N956	1108- 22	1	
2N956	1108- 23	1	
2N956	1108- 24	1	
2N956	1108- 36	1	
2N956	1108- 37	1	
2N956	1109- 8	1	
2N956	1109- 10	1	
2N956	1110- 16	1	
2N956	1110- 38	1	
2N956	1110- 49	1	
2N956	1110- 54	1	
3C2015BH3	1111- 23	1	
3PP4-66A	1106- 46	1	
3SAH1021	1107- 45	1	
30-1	1105- 17	1	
30-1	1105- 18	1	
30-1	1105- 19	1	
302-0509-000	1103- 20	2	
302-0509-000	1103- 26	1	
302-0516-000	1102- 68	1	
302-0516-000	1103- 41	1	
310-0046-000	1106- 11	2	
310-0046-000	1106- 20	2	
310-0071-000	1106- 15	2	
310-0071-000	1106- 23	2	
310-0128-000	1103- 64	2	
310-0128-000	1103- 79	2	
310-0128-000	1103- 93	2	
310-0155-000	1101- 11	4	
310-0155-000	1101- 17	8	
310-0155-000	1101- 20	2	
310-0155-000	1101- 28	8	
310-6320-000	1103- 52A	3	
3250LC10-103	1105- 9	1	
3250LC10-103	1105- 10	1	
3250LC10-103	1105- 11	1	
3250LC10-103	1105- 12	1	
3250LC10-103	1108- 74	1	
3250LC10-201	1106- 32	1	
3250LC10-201	1106- 39	1	
3250LC10-202	1105- 16	1	
3250LC10-500	1105- 14	1	

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
3250LC10-501	1105- 15	1	
3250LC10-501	1108- 73	1	
3250LC10-502	1105- 13	1	
330-1702-030	1101- 2	2	
330-1702-030	1101-13	2	
330-1702-030	1101- 31	1	
330-1702-030	1101- 33	1	
330-1702-080	1101- 8	29	
330-1702-080	1101- 10	4	
330-1702-080	1101- 16	8	
330-1702-080	1101- 19	2	
330-1702-080	1101- 22	8	
330-1702-080	1101- 27	8	
330-2099-000	1106- 3	1	
350-3005-010	1105-143	1	
350-3006-000	1105-138	1	
350-3006-010	1105-146	1	
3502-20-19	1101- 14	2	
3802-04-03	1101- 3	2	
4C1225BH3	1104- 6	1	
40C73A1	1102- 33	1	
40C73A1	1102- 59	1	
40C73A1	1102- 60	1	
40C73A1	1103- 19	1	
40C73A1	1104- 19	1	
4007-4	1103- 50	1	
4007-6HOTTINNED	1106- 9	1	
4007-6HOTTINNED	1106- 18	1	
4021HOTTINNED	1102- 66	1	
4040-2HOTTINNED	1103- 65	1	
425-1601-000	1103- 1	AR	
504-8229-001	1104- 24	1	
506-5927-003	1102- 69	1	
506-5927-003	1103- 39	1	
538002B2P093R	1102- 20	1	
538002E2P094R	1102- 22	1	
600-8133-006	1107- 52	1	
600-8133-007	1105-176	1	
600D476G075DG4	1111- 10	1	
600D476G075DG4	1111- 11	1	
600D605F200DD4	1101- 40	1	
667-0171-010	1110- 31	1	
668-0164-010	1111- 4	1	
668-0165-010	1101- 30	1	
668-0166-010	1111- 6	1	
668-0167-010	1101- 32	1	
68-1660-26	1103- 67	1	
68-1660-26	1103- 81	1	
756-7045-002	1105- 6	4	
757-0634-001	1101- 15	1	
757-0634-001	1103- 0	REF	
761-5316-019	1107- 8	3	
761-5316-036	1106- 30A	2	
763-8177-001	1103- 22	1	
763-8179-001	1103- 24	1	
763-8467-001	1101- 23	1	
763F2	1101- 37A	1	
763F2	1111- 53	1	
767-1421-001	1105-142	1	
767-1421-001	1105-145	1	
767-1421-001	1105-148	1	
768-1960-001	1103- 62	1	

NUMERICAL INDEX

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
768-1960-001	1103- 77	1	
768-1960-001	1103- 91	1	
768-3771-001	1107- 50	63	
768-7106-001	1105- 21	1	
768-7175-001	1102- 83	1	
768-7177-001	1101- 5	1	
768-7178-001	1103-100	1	
768-7242-001	1105- 20	3	
768-7243-001	1103- 61	1	
768-7243-001	1103- 76	1	
768-7243-001	1103- 90	1	
768-7245-001	1102- 1	1	
768-7251-002	1101- 4	1	
768-7288-001	1107- 17	1	
768-8735-001	1108- 53	1	
768-8823-001	1110- 28	1	
768-9039-001	1101- 18	1	
768-9039-001	1104- 0	REF	
768-9058-001	1104- 35	1	
768-9059-001	1101- 6	1	
768-9083-001	1101- 9	1	
768-9083-001	1102- 0	REF	
7717-130DAP	1109- 9	1	
7717-130DAP	1109- 11	1	
7717-130DAP	1110- 17	1	
7717-130DAP	1110- 25	1	
7717-130DAP	1110- 37	1	
7717-130DAP	1110- 39	1	
7717-130DAP	1110- 50	1	
7717-130DAP	1110- 55	1	
7717-64N	1109- 19	1	
7717-64N	1109- 21	1	
772-0626-001	1107- 5	1	
772-0746-001	1103- 74	1	
772-0746-001	1103- 88	1	
772-0789-001	1103- 66	1	
772-0789-001	1103- 80	1	
772-0790-001	1101- 0	1	
772-0990-001	1102- 58	1	
772-0790-003	1101- 0	1	
777-0355-001	1101- 26	1	
777-0355-001	1106- 0	REF	
777-0385-005	1107- 48	4	
777-0386-003	1105-171	6	
777-0436-001	1105-173	4	
777-0456-001	1107- 47	3	
777-0456-004	1107- 49	6	
777-0615-001	1106- 48	1	
777-0616-001	1101- 7	1	
777-7200-001	1103- 18	1	
777-7904-001	1101- 41	1	
777-7904-001	1107- 0	REF	
777-7904-002	1101- 41	1	
777-7905-001	1107- 12	1	
777-7913-001	1107- 1	1	
777-7913-001	1108- 0	REF	
777-7916-001	1107- 2	1	
777-7916-001	1109- 0	REF	
777-7919-001	1107- 3	1	
777-7919-001	1110- 0	REF	
777-7922-001	1107- 4	1	
777-7922-001	1111- 0	REF	

PART NUMBER	FIG. - ITEM	TTL REQ	AIRLINE PART NO.
778-5001-001	1101- 21	1	
778-5001-001	1105- 0	REF	
778-5001-002	1101- 21	1	
778-5001-002	1105- 0	REF	
778-5002-001	1105- 1	1	
778-5205-001	1102- 67	1	
778-5205-001	1103- 40	1	
778-5398-001	1103- 59	1	
778-5399-001	1103- 51	1	
791-0689-001	1101- 20A	1	
805-014X5V0103Z	1102- 72	1	
85932-1	1105-175	4	
85932-1	1107- 51	28	
85932-1	1108- 17	1	
85962	1105-172	2	
85962	1111- 69	30	
85964	1105-174	16	
92-1660-26	1103- 52	3	
997F15	1110- 40	1	

SYMBOL INDEX

SYMBOL	FIG. - ITEM	PART NUMBER
CR4	1106- 35	1N4002
C4	1101- 39	150D227X0010S2
C5	1101- 38	2C067104X0101A3
C6	1101- 40	600D605F200DD4
C7	1101- 29	CK46M104K
FL1	1101- 12	2B55
FL2	1101- 1	A102
L3	1101- 30	668-0165-010
L4	1101- 32	668-0167-010
Q1	1106- 5	2N4226
Q2	1106- 1	2N4226
Q3	1106- 8	SJ1391
Q4	1106- 40	S21825
Q9	1106- 25	MM2187
Q10	1106- 17	2N3054
Q11	1106- 26	2N956
RT3	1101- 37A	763F2
R14	1106- 39	3250LC10-201
R29	1106- 32	3250LC10-201
VR1	1106- 33	1N3338B
VR5	1101- 23	763-8467-001
Z1	1101- 41	777-7904-001
Z1	1107- 0	777-7904-001
Z1	1101- 41	777-7904-002
Z1CR1	1107- 31	1N645
Z1CR2	1107- 34	1N645
Z1CR3	1107- 28	1N645
Z1CR4	1107- 27	1N645
Z1CR7	1107- 26	1N645
Z1CR8	1107- 37	1N645
Z1CR9	1107- 36	1N645
Z1C1	1107- 35	150D157X0015S2
Z1C5	1107- 16	D41822
Z1C6	1107- 15	150D476X0020R2
Z1K1	1107- 45	3SAH1021
Z1L1	1107- 14	MS90539-08
Z1P1	1107- 5	772-0626-001
Z1Q1	1107- 43	2N1711
Z1Q2	1107- 44	2N956
Z1Q3	1107- 21	2N956
Z1Q4	1107- 20	2N956
Z1Q5	1107- 27B	2N956
Z1R1	1107- 32	RN55D2152F
Z1R2	1107- 33	RC07GF222K
Z1R5	1107- 29	RC07GF562K
Z1R6	1107- 22	RC07GF473K
Z1R7	1107- 25	RC07GF103K
Z1R9	1107- 19	RC07GF472K
Z1R10	1107- 24	RC07GF472K
Z1R15	1107- 13	RC07GF102K
Z1R16	1107- 23	RC07GF103K
Z1R17	1107- 41	RC07GF332K
Z1R18	1107- 42	RC07GF272K
Z1R19	1107- 39	RC07GF332K
Z1R20	1107- 40	RC07GF332K
Z1R21	1107- 27A	RC07GF223K
Z1VR1	1107- 30	1N758A
Z1VR2	1107- 38	1N751A
Z2	1101- 21	778-5001-001
Z2	1105- 0	778-5001-001
Z2A1	1105-146	350-3006-010
Z2A2	1105-143	350-3005-010
Z2A3	1105-138	350-3006-010
Z2C5	1105- 78	CM06FD432G03
Z2C6	1105- 77	CM06FD432G03
Z2A7	1105-144	SF31
Z9C9	1104- 6	CM04FD271J03
Z2A11	1105-141	SG41
Z2C11	1105-149	190D187X9025T2
Z2A12	1105-147	SG141
Z2CR1	1105- 5	1N645
Z2CR2	1105- 4	1N645
Z2CR3	1105-156	1N645
Z2CR4	1105-158	1N645
Z2CR5	1105- 88	1N645
Z2CR6	1105- 32	1N645
Z2CR7	1105- 31	1N645
Z2CR8	1105-120	1N645
Z2CR9	1105-119	1N645
Z2CR10	1105-108	1N645
Z2CR11	1105-115	1N645
Z2CR12	1105- 99	1N645
Z2CR13	1105- 92	1N645
Z2CR14	1105- 94	1N645
Z2CR15	1105- 95	1N645
Z2CR16	1105- 73	1N645
Z2CR17	1105- 74	1N645
Z2CR18	1105-101	1N645
Z2CR19	1105- 67	1N645
Z2CR20	1105- 63	1N645
Z2CR21	1105- 56	1N645
Z2CR22	1105- 57	1N645
Z2CR23	1105- 58	1N645
Z2CR24	1105- 59	1N645
Z2CR25	1105- 52	1N645
Z2CR26	1105- 51	1N645
Z2CR27	1105- 45	1N645
Z2CR28	1105- 44	1N645
Z2CR29	1105-139	1N914
Z2C1	1105-166	192P4739R8
Z2C2	1105-167	192P4739R8
Z2C3	1105- 90	150D475X0035B2
Z2C4	1105- 91	150D336X0010B2
Z2C5	1105- 78	CM06FD432G03
Z2C6	1105- 77	CM06FD432G03
Z2C7	1105- 25	192P2249R8
Z2C8	1105- 54	151D116X9015X2
Z2C9	1105-136	192P47192
Z2C10	1105-112	109D686X0030F2
Z2C12	1105-111	150D475X0035B2
Z2C13	1105-135	2C067104X0101A3
Z2Q1	1105- 86	2N3904
Z2Q2	1105- 85	2N3904
Z2Q3	1105-153	2N956
Z2Q4	1105-154	2N956
Z2Q5	1105-155	2N956
Z2Q6	1105- 28	2N956
Z2Q7	1105- 75	2N2907A
Z2Q8	1105- 76	2N2907A
Z2Q9	1105-131	2N2907A
Z2Q10	1105-133	2N956
Z2Q11	1105-123	2N2907A
Z2Q12	1105-122	2N956
Z2Q13	1105-105	2N2907A
Z2Q14	1105- 93	2N2907A
Z2Q15	1105-104	2N956

SYMBOL INDEX

SYMBOL	FIG. - ITEM	PART NUMBER
Z2Q16	1105- 65	2N956
Z2Q17	1105- 64	2N956
Z2Q18	1105- 47	2N956
Z2R1	1105-168	RC20GF102K
Z2R2	1105- 24	MF1-10 13300F
Z2R3	1105- 83	RC07GF222K
Z2R4	1105- 84	RC07GF222K
Z2R5	1105- 16	3250LC10-202
Z2R6	1105- 2	MF1-10 39200FT1
Z2R7	1105- 23	RN60C1002F
Z2R8	1105- 3	RN60C1002F
Z2R9	1105-150	RC07GF331K
Z2R10	1105-159	RN60D1001F
Z2R11	1105-157	RN55D1002F
Z2R12	1105-151	RC07GF331K
Z2R13	1105-160	RN60D1001F
Z2R14	1105-163	RN55D2611F
Z2R15	1105-162	RN55D1471F
Z2R16	1105-161	RN55D1002F
Z2R17	1105-152	RC07GF331K
Z2R18	1105-165	RN60D1001F
Z2R19	1105-164	RN60C4221F
Z2R20	1105- 87	RN55D1211F
Z2R21	1105- 89	RN55D1002F
Z2R22	1105-169	RN55D1782F
Z2R23	1105-170	RN55D2151F
Z2R24	1105- 27	RC07GF271K
Z2R25	1105- 81	RC07GF680K
Z2R26	1105- 30	RN60C3830F
Z2R27	1105- 15	3250LC10-501
Z2R28	1105- 29	RN60C1001F
Z2R29	1105- 80	RC07GF222K
Z2R30	1105- 35	RN60C1212F
Z2R31	1105- 34	RN60C1212F
Z2R32	1105- 79	RC07GF222K
Z2R33	1105- 13	3250LC10-502
Z2R34	1105- 33	RC07GF682K
Z2R35	1105-137	RN55D5112F
Z2R36	1105-140	RC07GF123K
Z2R37	1105-130	RC07GF102K
Z2R38	1105-129	RC07GF182K
Z2R39	1105-126	RC07GF153K
Z2R40	1105-127	RC07GF103K
Z2R41	1105-128	RC07GF332K
Z2R42	1105-121	RC07GF223K
Z2R43	1105-124	RC07GF223K
Z2R44	1105-125	RC07GF103K
Z2R45	1105-118	RN55D9092F
Z2R46	1105-107	RC07GF153K
Z2R47	1105-106	RC07GF103K
Z2R48	1105-100	RC07GF103K
Z2R49	1105-109	RC07GF153K
Z2R50	1105-110	RC07GF223K
Z2R51	1105-116	MF1-10 16202F
Z2R52	1105-113	RC07GF103K
Z2R53	1105-114	RC07GF104K
Z2R54	1105- 98	RC07GF153K
Z2R55	1105-103	RC07GF154K
Z2R56	1105-102	RC07GF154K
Z2R57	1105- 97	RC07GF822K
Z2R58	1105- 96	RC07GF103K
Z2R59	1105- 66	RC07GF103K
Z2R60	1105- 70	RC07GF272K
Z2R61	1105- 71	RC07GF472K
Z2R62	1105- 72	RC07GF471K
Z2R63	1105- 61	RC07GF103K
Z2R64	1105- 62	RC07GF272K
Z2R65	1105- 68	RC07GF472K
Z2R66	1105- 69	RC07GF471K
Z2R67	1105- 60	RC07GF103K
Z2R68	1105- 42	RN55D5111F
Z2R69	1105- 43	RN55D5621F
Z2R70	1105- 9	3250LC10-103
Z2R71	1105- 41	RN55D5621F
Z2R72	1105- 38	RN55D5111F
Z2R73	1105- 36	RN55D1332F
Z2R74	1105- 37	RN55D5111F
Z2R75	1105- 11	3250LC10-103
Z2R76	1105- 40	RN55D1332F
Z2R77	1105- 39	RN55D5111F
Z2R78	1105- 12	3250LC10-103
Z2R79	1105- 10	3250LC10-103
Z2R80	1105- 49	RC07GF392K
Z2R81	1105- 50	RN55D4641F
Z2R82	1105- 48	RN55D1331F
Z2R83	1105- 46	RC07GF273K
Z2R84	1105- 53	RC07GF103K
Z2R85	1105- 55	RC07GF103K
Z2R86	1105- 14	3250LC10-500
Z2R87	1105-134	RC07GF103K
Z2S1	1105- 17	30-1
Z2S2	1105- 18	30-1
Z2S3	1105- 19	30-1
Z2VR1	1105- 82	JAN1N746A
Z2VR2	1105- 26	JAN1N746A
Z2VR3	1105-117	1N754A
Z3	1107- 1	777-7913-001
Z3	1108- 0	777-7913-001
Z3CR1	1108- 50	1N3064
Z3CR2	1108- 49	1N3064
Z3CR3	1108- 43	1N3064
Z3CR4	1108- 47	1N3064
Z3C1	1108- 14	192P1039R8
Z3C2	1108- 19	CK16M104M
Z3C3	1108- 6	150D225X0020A2
Z3C4	1108- 12	192P1049R8
Z3C5	1108- 7	192P1049R8
Z3C6	1108- 1	192P1049R8
Z3C7	1108- 8	150D225X0020A2
Z3C8	1108- 69	192P1049R8
Z3C9	1108- 2	192P1049R8
Z3C10	1108- 60	150D476X0035S2
Z3C11	1108- 61	150D225X0020A2
Z3C12	1108- 58	CK16M104M
Z3C13	1108- 48	192P1049R8
Z3C14	1108- 45	DM10F151J
Z3C15	1108- 44	DM10F151J
Z3C16	1108- 25	150D277X9015S2
Z3C17	1108- 55	150D106X0020B2
Z3C18	1108- 20	150D336X0020R2
Z3C21	1108- 21	192P1049R8
Z3C22	1108- 32	150D475X0010A2
Z3HD1	1108- 57	TR118
Z3J5	1108- 77	105-0754-150
Z3J6	1108- 68	105-0760-150
Z3L1	1108- 54	MS90539-08

SYMBOL INDEX

SYMBOL	FIG. - ITEM	PART NUMBER
Z3Q1	1108- 13	2N3337
Z3Q2	1108- 75	2N3337
Z3Q3	1108- 56	2N3011
Z3Q4	1108- 41	2N930
Z3Q5	1108- 40	2N2907A
Z3Q6	1108- 37	2N956
Z3Q7	1108- 36	2N956
Z3Q8	1108- 22	2N956
Z3Q10	1108- 23	2N956
Z3Q11	1108- 24	2N956
Z3R1	1108- 15	RC07GF122K
Z3R2	1108- 16	RC07GF101K
Z3R3	1108- 10	RC07GF100K
Z3R4	1108- 9	RC07GF152J
Z3R5	1108- 11	RC07GF102K
Z3R6	1108- 5	RC07GF470K
Z3R7	1108- 4	RC07GF182K
Z3R8	1108- 3	RC07GF101K
Z3R9	1108- 73	3250LC10-501
Z3R10	1108- 18	RC07GF122J
Z3R11	1108- 78	RC07GF102K
Z3R12	1108- 79	RC07GF470K
Z3R13	1108- 64	RC07GF152K
Z3R14	1108- 65	RC07GF152K
Z3R15	1108- 62	RC07GF471K
Z3R16	1108- 59	RC07GF333K
Z3R17	1108- 63	RC07GF470K
Z3R18	1108- 39	RC07GF123K
Z3R19	1108- 29	RC07GF150K
Z3R20	1108- 51	RN55D4642F
Z3R21	1108- 46	RC07GF223K
Z3R22	1108- 66	RC07GF101K
Z3R23	1108- 67	RC07GF471K
Z3R24	1108- 35	RC07GF563K
Z3R25	1108- 34	RC07GF151K
Z3R26	1108- 38	RC07GF102K
Z3R27	1108- 33	RC07GF272K
Z3R28	1108- 26	RC07GF272K
Z3R29	1108- 76	RC07GF102K
Z3R30	1108- 30	RC07GF150K
Z3R31	1108- 27	RN55D2153F
Z3R32	1108- 28	RN55D6812F
Z3R33	1108- 31	RN55D7500F
Z3T1	1108- 52	A101
Z3VR3	1108- 42	1N755A
Z3Z5R6	1108- 74	3250LC10-103
Z4	1107- 2	777-7916-001
Z4	1109- 0	777-7916-001
Z4C1	1109- 34	151D115X9020W2
Z4C2	1109- 2	192P4739R8
Z4C3	1109- 24	150D225X9035B2
Z4C4	1109- 12	150D473X0035A2
Z4C5	1109- 27	150D473X0035A2
Z4C6	1109- 14	150D473X0035A2
Z4C7	1109- 16	150D473X0035A2
Z4J8	1109- 1	105-0758-150
Z4J9	1109- 35	105-0762-150
Z4Q1	1109- 8	2N956
Z4Q2	1109- 10	2N956
Z4Q3	1109- 18	2N1711
Z4Q4	1109- 20	2N1711
Z4R1	1109- 26	RC07GF100K
Z4R2	1109- 25	RC07GF100K
Z4R3	1109- 3	RC07GF271K
Z4R4	1109- 4	RC07GF272K
Z4R5	1109- 32	RC07GF391K
Z4R6	1109- 28	RC07GF472K
Z4R7	1109- 29	RC07GF332K
Z4R8	1109- 30	RC07GF332K
Z4R9	1109- 31	RC07GF472K
Z4R10	1109- 5	RC07GF182K
Z4R11	1109- 6	RC07GF820K
Z4R12	1109- 7	RC07GF820K
Z4R13	1109- 15	RC07GF150K
Z4R14	1109- 17	RC07GF150K
Z4R15	1109- 22	RC20GF331K
Z4T1	1109- 33	TF4SX13YY
Z4T2	1109- 13	TF4SX13YY
Z4VR1	1109- 23	1N3030B
Z5	1107- 3	777-7919-001
Z5	1110- 0	777-7919-001
Z5C1	1110- 57	150D106X0020B2
Z5C2	1110- 56	192P1039R8
Z5C3	1110- 1	150D476X0035S2
Z5C4	1110- 53	150D334X0035A2
Z5C5	1110- 15	150D476X0006B2
Z5C6	1110- 8	150D337X0006S2
Z5C7	1110- 4	150D336X0035S2
Z5C8	1110- 42	150D106X0020B2
Z5C9	1110- 33	150D105X0035A2
Z5C10	1110- 35	150D105X0035A2
Z5C11	1110- 18	150D105X0035A2
Z5C12	1110- 32	192P1039R8
Z5FL1	1110- 27	KL697
Z5Q1	1110- 54	2N956
Z5Q2	1110- 49	2N956
Z5Q3	1110- 16	2N956
Z5Q4	1110- 38	2N956
Z5Q5	1110- 24	2N3700
Z5Q6	1110- 36	2N3700
Z5Q7	1101- 34	2N2405
Z5Q8	1101- 35	2N2405
Z5RT1	1110- 40	997F15
Z5R1	1110- 58	RC07GF823K
Z5R2	1110- 3	RC07GF273K
Z5R3	1110- 2	RC07GF471K
Z5R4	1110- 48	RC20GF220K
Z5R5	1110- 6	RC07GF472K
Z5R7	1110- 51	RC07GF103K
Z5R8	1110- 7	RC07GF101K
Z5R9	1110- 52	RC07GF103K
Z5R10	1110- 47	RC20GF821K
Z5R11	1110- 14	RC07GF472K
Z5R12	1110- 9	RC07GF151K
Z5R13	1110- 10	RC07GF100K
Z5R14	1110- 11	RC07GF472K
Z5R15	1110- 5	RW69V820
Z5R16	1110- 13	RC20GF391K
Z5R17	1110- 12	RC07GF121K
Z5R18	1110- 44	RC07GF681K
Z5R19	1110- 43	RC07GF332K
Z5R20	1110- 34	RC07GF471K
Z5R21	1110- 45	RC07GF102K
Z5R22	1110- 41	RC07GF471K
Z5R23	1110- 21	RC07GF562J
Z5R24	1110- 23	RC07GF332K

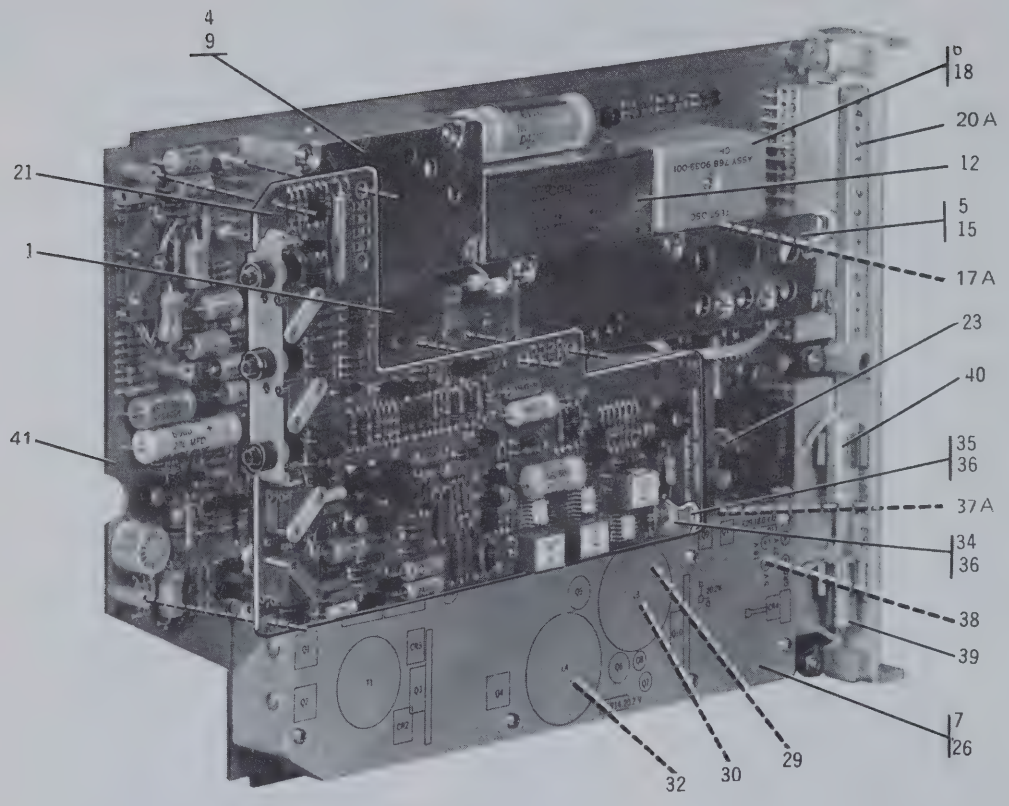
SYMBOL INDEX

SYMBOL	FIG. - ITEM	PART NUMBER
Z5R25	1110- 22	RC07GF332K
Z5R26	1110- 20	RC07GF391K
Z5R27	1110- 19	RC07GF391K
Z5R28	1110- 26	RW69V100
Z5R29	1110- 30	RW69V100
Z5R30	1110- 46	RC07GF681K
Z5T1	1110- 31	667-0171-010
Z6	1107- 4	777-7922-001
Z6	1111- 0	777-7922-001
Z6CR1	1111- 66	1N645
Z6CR2	1111- 63	NS3001
Z6CR3	1111- 7	NS3001
Z6CR5	1111- 21	1N645
Z6CR6	1111- 20	1N629
Z6CR8	1111- 8	NS3001
Z6CR10	1111- 26	1N645
Z6CR11	1111- 25	1N645
Z6CR14	1111- 41	1N645
Z6CR15	1111- 40	1N645
Z6C1	1111- 1	130D826X0030T2
Z6C2	1111- 5	CK15M472M
Z6C3	1111- 64	150D227X0010S2
Z6C8	1111- 10	600D476G075DG4
Z6C9	1111- 11	600D476G075DG4
Z6C10	1111- 23	3C2015BH3
Z6C11	1111- 12	2C067104X0101A3
Z6C12	1111- 13	2C067104X0101A3
Z6C13	1111- 44	109D187X0025T2
Z6C14	1111- 31	CS12BF685M
Z6C15	1111- 45	2C067104X0101A3
Z6C16	1111- 37	130D826X0030T2
Z6C17	1111- 38	CS13BC336M
Z6C18	1111- 36	CS13BD226M
Z6C19	1111- 27	CT14-223K
Z6C20	1111- 31A	CK16M104M
Z6L1	1111- 4	668-0164-010
Z6L2	1111- 6	668-0166-010
Z6Q5	1111- 24	2N3440
Z6Q6	1111- 60	2N3440
Z6Q7	1111- 57	2N4029
Z6Q8	1111- 58	2N2907A
Z6Q12	1111- 39	2N2907A
Z6RT1	1111- 53	763F2
Z6RT2	1111- 49	TM1-8 1000-10
Z6R1	1111- 3	RC07GF470K
Z6R2	1111- 68	RC07GF180K
Z6R3	1111- 67	RC07GF180K
Z6R4	1111- 2	RC07GF562K
Z6R5	1111- 18	RC07GF562K
Z6R6	1111- 14	RC07GF560K
Z6R7	1111- 22	RC07GF122K
Z6R8	1111- 15	RC07GF563K
Z6R9	1111- 16	RC07GF471K
Z6R10	1111- 17	RC07GF821K
Z6R11	1111- 62	RW69V821
Z6R12	1111- 19	RC20GF222K
Z6R13	1111- 56	RN60C1101F
Z6R15	1111- 55	RN60C5620F
Z6R16	1111- 59	RC07GF152K
Z6R17	1111- 54	RC07GF122K
Z6R18	1111- 50	RS200BR3300F
Z6R20	1111- 52	C1514
Z6R21	1111- 29	RC07GF102K
Z6R22	1111- 48	RC07GF222K
Z6R24	1111- 30	G2-220PORM1PCTV
Z6R25	1111- 32	RC07GF681K
Z6R26	1111- 28	RC07GF220K
Z6R27	1111- 43	RC07GF102K
Z6R28	1111- 46	RN60C1001F
Z6R30	1111- 33	RN60C5620F
Z6R31	1111- 9	RW69V4R7
Z6R32	1111- 34	RC07GF221K
Z6R33	1111- 35	RC07GF221K
Z6T1	1111- 65	A17030
Z6VR2	1111- 61	1N3024B
Z6VR3	1111- 51	1N753A
Z6VR4	1111- 47	1N751A
Z6VR5	1111- 42	1N753A
Z7	1101- 9	768-9083-001
Z7	1102- 0	768-9083-001
Z7CR1	1102- 62	D6729
Z7CR2	1102- 73	1N457
Z7C1	1102- 22	538002E2P094R
Z7C2	1102- 56	CK12AX102M
Z7C3	1102- 71	192P1039R8
Z7C4	1102- 20	538002B2P093R
Z7C5	1102- 65	VC21GY
Z7C7	1102- 59	40C73A1
Z7C8	1102- 60	40C73A1
Z7C9	1102- 47	CK16M104M
Z7C10	1102- 14	CK16M104M
Z7C11	1102- 13	CK16M104M
Z7C12	1102- 38	CK16M104M
Z7C13	1102- 28	192P1039R8
Z7C13	1102- 28	2C067103X0101A3
Z7C14	1102- 40	CK16M104M
Z7C15	1102- 11	150D225X0020A2
Z7C16	1102- 45	CK16M104M
Z7C17	1102- 26	192P1039R8
Z7C17	1102- 26	2C067103X0101A3
Z7C18	1102- 34	192P3329R8
Z7C18	1102- 34	2C067332X0101A3
Z7C19	1102- 32	CK15M122M
Z7C19	1102- 32	192P1229R8
Z7C20	1102- 33	40C73A1
Z7C21	1102- 6	DM10E330J
Z7C22	1102- 9	DM10F221J
Z7C23	1102- 39	CK16M104M
Z7C24	1102- 23	CK16M104M
Z7C25	1102- 50	CK16M104M
Z7C26	1102- 46	CK15M103M
Z7C27	1102- 72	805-014X5V0103Z
Z7C28	1102- 60A	DM10C030D0
Z7L1	1102- 55	A110
Z7L2	1102- 63	1025-48
Z7L3	1102- 30	1025-30
Z7L4	1102- 7	1025-62
Z7L5	1102- 24	1025-62
Z7L6	1102- 53	1025-62
Z7Q1	1102- 21	2N3823
Z7Q2	1102- 19	2N3337
Z7Q3	1102- 10	2N918
Z7Q4	1102- 29	2N918
Z7R1	1102- 52	RN55D3651F
Z7R1	1102- 52	RN55D1622F
Z7R2	1102- 64	RC07GF562K

SYMBOL INDEX

SYMBOL	FIG. - ITEM	PART NUMBER
Z7R3	1102- 48	RC07GF182K
Z7R4	1102- 70	RC07GF222K
Z7R5	1102- 54	RC07GF471K
Z7R6	1102- 18	RC07GF122K
Z7R7	1102- 16	RC07GF152K
Z7R8	1102- 17	RC07GF102K
Z7R9	1102- 15	RC07GF470K
Z7R10	1102- 41	RC07GF472K
Z7R11	1102- 42	RC07GF472K
Z7R12	1102- 31	RC07GF470K
Z7R13	1102- 12	RC07GF472K
Z7R14	1102- 27	RC07GF102K
Z7R15	1102- 25	RC07GF101K
Z7R16	1102- 36	RC07GF103K
Z7R17	1102- 37	RC07GF103K
Z7R18	1102- 8	RC07GF562K
Z7R19	1102- 35	RC07GF562K
Z7R20	1102- 43	RC07GF391K
Z7R21	1102- 57	RN55D9091F
Z7R22	1102- 51	RC07GF392K
Z7R23	1102- 61	RC07GF472K
Z7T1	1102- 58	772-0990-001
Z7VR1	1102- 44	1N962B
Z7VR2	1102- 49	1N746A
Z7Y1	1102- 5	S289-7024-010
Z8	1101- 15	757-0634-001
Z8	1103- 0	757-0634-001
Z8C1	1103- 83	MA4394
Z8C2	1103- 85	JMC2903
Z8C3	1103- 84	MA4394
Z8C4	1103- 86	CK12AX102M
Z8C5	1103- 45	19C372
Z8C6	1103- 70	MA4394
Z8C7	1103- 71	JMC2903
Z8C8	1103- 69	MA4394
Z8C9	1103- 72	CK12AX102M
Z8C10	1103- 46	19C372
Z8C11	1103- 54	CK12AX102M
Z8C12	1103- 56	JMC2903
Z8C13	1103- 55	MA4394
Z8C14	1103- 57	CK12AX102M
Z8C16	1103- 31	19C372
Z8C17	1103- 12	DM10E300J
Z8C18	1103- 16	DM10C050J
Z8C19	1103- 14	DM10F101J
Z8C20	1103- 38	VC21GY
Z8C21	1103- 9	40C73A1
Z8C22	1103- 10	192P1049R8
Z8C23	1103- 44	19C372
Z8C24	1103- 37	19C372
Z8C31	1103- 6	192P1049R8
Z8C34	1103- 15	TC20-101
Z8C35	1103- 43	150D1696
Z8L1	1103- 88	772-0746-001
Z8L2	1103- 74	772-0746-001
Z8L3	1103- 59	778-5398-001
Z8L4	1103- 28	1025-30
Z8L5	1103- 35	MS90539-15
Z8L6	1103- 42	A110
Z8L8	1103- 36	1025-04
Z8L9	1103- 5	1025-62
Z8L11	1103- 49	MS18130-10
Z8Q1	1103- 29	2N4416
Z8Q2	1103- 30	2N4416
Z8R1	1103- 87	RC07GF104K
Z8R2	1103- 47	RC07GF223K
Z8R3	1103- 73	RC07GF104K
Z8R4	1103- 48	RC07GF223K
Z8R5	1103- 58	RC07GF104K
Z8R6	1103- 11	RC07GF151J
Z8R6	1103- 11	RC07GF161J
Z8R6	1103- 11	RC07GF181J
Z8R6	1103- 11	RC07GF201J
Z8R6	1103- 11	RC07GF221J
Z8R6	1103- 11	RC07GF241J
Z8R6	1103- 11	RC07GF271J
Z8R6	1103- 11	RC07GF301J
Z8R6	1103- 11	RC07GF331J
Z8R6	1103- 11	RC07GF361J
Z8R6	1103- 11	RC07GF391J
Z8R6	1103- 11	RC07GF431J
Z8R6	1103- 11	RC07GF471J
Z8R7	1103- 8	RC07GF221K
Z8R8	1103- 7	RC07GF102K
Z8R11	1103- 33	RC07GF121K
Z8R12	1103- 34	RC07GF390K
Z8R13	1103- 32	RC07GF221K
Z8R17	1101- 17A	RC07GF103K
Z8R17	1101- 17A	RC07GF123K
Z8R17	1101- 17A	RC07GF153K
Z8R17	1101- 17A	RC07GF183K
Z8R17	1101- 17A	RC07GF223K
Z8R17	1101- 17A	RC07GF273K
Z8R17	1101- 17A	RC07GF333K
Z8R17	1101- 17A	RC07GF393K
Z8R17	1103- 17	RC07GF563K
Z8R18	1103- 13	RC07GF123K
Z8T1	1103- 23	A105
Z8T2	1103- 18	777-7200-001
Z9	1101- 18	768-9039-001
Z9	1104- 0	768-9039-001
Z9C1	1104- 19	40C73A1
Z9C2	1104- 20	DM10F221J
Z9C4	1104- 1	150D685X0006A2
Z9C5	1104- 16	DM10F560J
Z9C6	1104- 15	DM15F511K03
Z9C7	1104- 10	CK12AX102M
Z9C8	1104- 7	DM10E220J
Z9C9	1104- 6	4C1225BH3
Z9C10	1104- 14	DA718-001
Z9C11	1104- 4	DA718-001
Z9C13	1104- 3	DA718-001
Z9L1	1104- 17	1025-34
Z9L2	1104- 2	1025-62
Z9Q1	1104- 22	2N918
Z9Q2	1104- 13	2N918
Z9R1	1104- 21	RC07GF103K
Z9R3	1104- 18	RC07GF562K
Z9R4	1104- 5	RC07GF122K
Z9R5	1104- 8	RC07GF333K
Z9R6	1104- 11	RC07GF823K
Z9R7	1104- 12	RC07GF562K
Z9R8	1104- 9	RC07GF182K
Z9Y1	1104- 23	S289-1585-000

GROUP ASSEMBLY PARTS LIST



1051B-1 VHF NAV Receiver Planar Assembly
Figure 1101

	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
R	1101 - 0	772-0790-001		1051B-1 VHF NAV RECEIVER PLANAR ASSEMBLY		1	A
R	1101 - 0	772-0790-003	1	1051B-1 VHF NAV RECEIVER PLANAR ASSEMBLY		1	B
	1	A102	2	FILTER 81815 241-0569-010	FL2	1	
R	- 2	330-1702-030	2	SCREW, SELF-LKG, CAD, PL STL, PAN HD, 4-40 X 1/4 COML AP		2	
	- 3	3802-04-03	2	WASHER, SPG TENS, BE, COP, 0.124 ID, 0.245 OD 78189 310-0468-020 AP		2	
	4	768-7251-002	2	COVER, 18 MHZ IF P		1	
	5	768-7177-001	2	COVER, TUNER P		1	
	6	768-9059-001	2	COVER, TEST OSC P		1	
	7	777-0616-001	2	COVER, PWR SUP		1	
R	- 8	330-1702-080	2	SCREW, SELF-LKG, CAD, PL STL, PAN HD, 2-56 X 1/4 COML AP FOR 4 THRU 7		29	
	9	768-9083-001	2	18 MHZ IF SEE FIG. 1102	Z7	1	
R	- 10	330-1702-080	2	SCREW, SELF-LKG, CAD, PL STL, PAN HD, 2-56 X 1/4 COML AP		4	

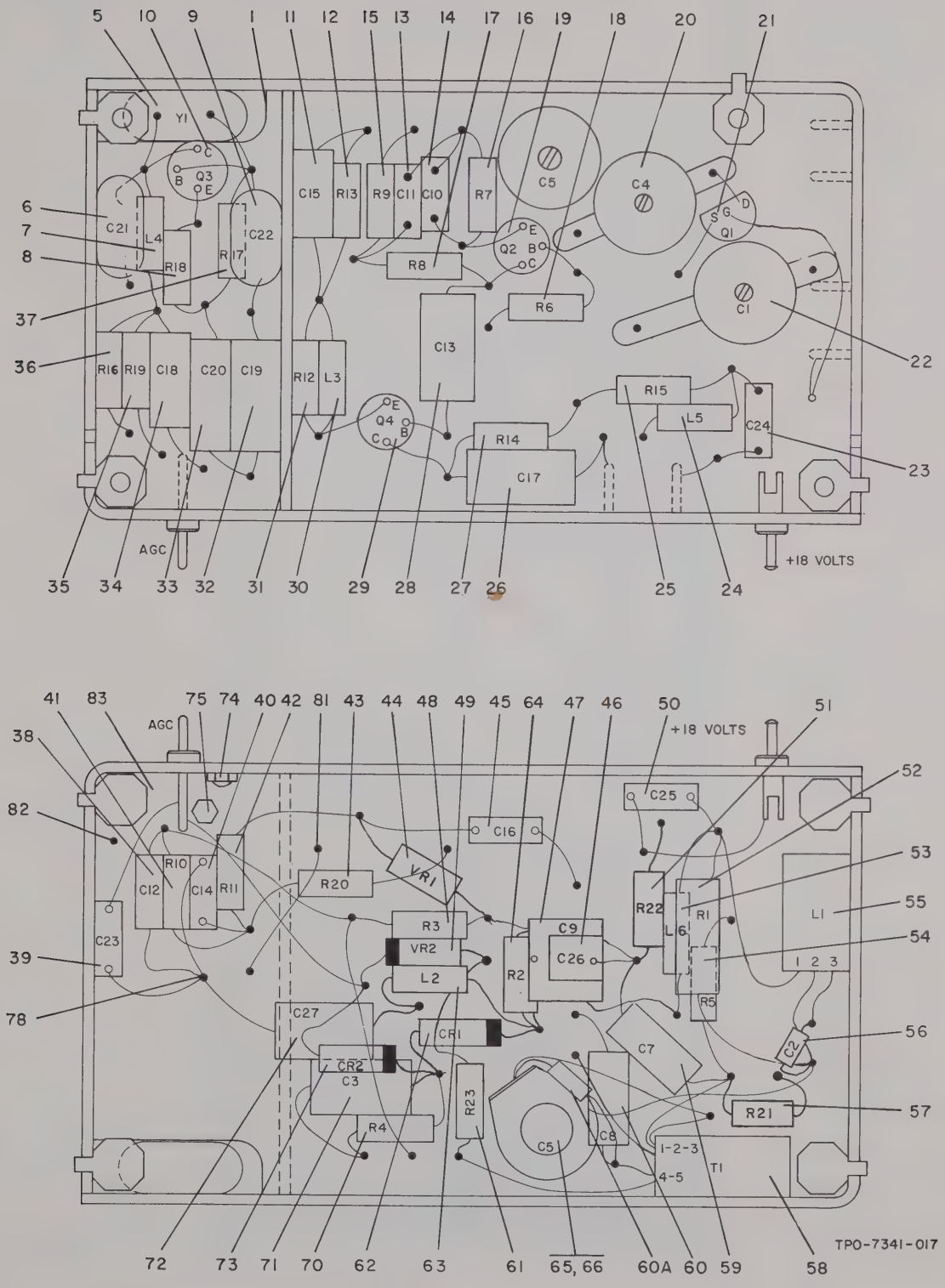
GROUP ASSEMBLY PARTS LIST

	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
	1101 - 11	310-0155-000	2	WASHER, SPG TENS, CAD. PL STL, 0.095 ID, 0.186 OD COML AP		4	
	12	2B55	2	FILTER 00136 293-1188-020	FL1	1	
R	- 13	330-1702-030	2	SCREW, SELF-LKG, CAD. PL STL, PAN HD, 4-40 X 1/4 COML AP		2	
	- 14	3502-20-19	2	WASHER, SPG TENS, BE. COP. 0.124 ID, 0.245 OD 78189 310-0468-020 AP		2	
	15	757-0634-001	2	TUNER P SEE FIG. 1103	Z8	1	
R	- 16	330-1702-080	2	SCREW, SELF-LKG, CAD. PL STL, PAN HD, 2-56 X 1/4 COML AP		8	
	- 17	310-0155-000	2	WASHER, SPG TENS, CAD. PL STL, 0.095 ID, 0.186 OD COML AP		8	
R	17A	RC07GF103K	2	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000 EFF MCN 151	Z8R17	AR	
R	17A	RC07GF123K	2	RESISTOR, FXD, 12,000 OHMS 10%, 1/4 W 745-0788-000 EFF MCN 151	Z8R17	AR	
R	17A	RC07GF153K	2	RESISTOR, FXD, 15,000 OHMS 10%, 1/4 W 745-0791-000 EFF MCN 151	Z8R17	AR	
R	17A	RC07GF183K	2	RESISTOR, FXD, 18,000 OHMS 10%, 1/4 W 745-0794-000 EFF MCN 151	Z8R17	AR	
R	17A	RC07GF223K	2	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000 EFF MCN 151	Z8R17	AR	
R	17A	RC07GF273K	2	RESISTOR, FXD, 27,000 OHMS 10%, 1/4 W 745-0800-000 EFF MCN 151	Z8R17	AR	
R	17A	RC07GF333K	2	RESISTOR, FXD, 33,000 OHMS 10%, 1/4 W 745-0803-000 EFF MCN 151	Z8R17	AR	
R	17A	RC07GF393K	2	RESISTOR, FXD, 39,000 OHMS 10%, 1/4 W 745-0806-000 EFF MCN 151	Z8R17	AR	
	18	768-9039-001	2	TEST OSCILLATOR P SEE FIG. 1104	Z9	1	
R	- 19	330-1702-080	2	SCREW, SELF-LKG, CAD. PL STL, PAN HD, 2-56 X 1/4 COML AP		2	
	- 20	310-0155-000	2	WASHER, SPG TENS, CAD. PL STL, 0.095 ID, 0.186 OD COML AP		2	
R	20A	791-0689-001	2	PLATE, DESIGNATION		1	
	21	778-5001-001	2	TEST GENERATOR P SEE FIG. 1105	Z2	1	A
R	21	778-5001-002	2	TEST GENERATOR P SEE FIG. 1105	Z2	1	B
R	- 22	330-1702-080	2	SCREW, SELF-LKG, CAD. PL STL, PAN HD, 2-56 X 1/4 COML AP		8	
	23	763-8467-001	2	SEMICOND DEVICE, DIODE	VR5	1	
	- 24	P334-0265-00 0	2	NUT, PLAIN, HEX., SST, 10-32 77250 334-0265-000 AP		1	
	- 25	1810-00	2	WASHER, LOCK, PH BRZ, 0.204 ID, 0.406 OD 78189 373-7040-000 AP		1	
	26	777-0355-001	2	CHASSIS, PWR SUP SEE FIG. 1106		1	
R	- 27	330-1702-080	2	SCREW, SELF-LKG, CAD. PL STL, PAN HD, 2-56 X 1/4 COML AP		8	
	- 28	310-0155-000	2	WASHER, SPG TENS, CAD. PL STL, 0.095 ID, 0.186 OD COML AP		8	
R	29	CK46M104K	2	CAPACITOR, FXD, 100,000 PF 10%, 100 VDCW 86335 913-4489-320	C7	1	
	30	668-0165-010	2	REACTOR, 314 UH 95105	L3	1	
R	- 31	330-1702-030	2	SCREW, SELF-LKG, CAD. PL STL, PAN HD, 4-40 X 1/4 COML AP		1	
	32	668-0167-010	2	REACTOR, 740 UH 95105	L4	1	
R	- 33	330-1702-030	2	SCREW, SELF-LKG, CAD. PL STL, PAN HD, 4-40 X 1/4 COML AP		1	
	34	2N2405	2	TRANSISTOR 352-0479-000	Z5Q7	1	
	35	2N2405	2	TRANSISTOR 352-0479-000	Z5Q8	1	

GROUP ASSEMBLY PARTS LIST

	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
	1101 36	TXB2P032-037 -3B	2	HOLDER 98978 352-9884-000		2	
	- 37	MW406-95	2	INSULATOR 08289 302-0640-360 AP FOR 35 AND 36		2	
R	37A	763F2	2	RESISTOR, THRM, 10 OHMS 10%, 1 W 10646 714-1728-000	RT3	1	
	38	2C067104X010 1A3	2	CAPACITOR, FXD, 0.1 UF 20%, 100 VDCW 56289 913-4240-040	C5	1	
	39	150D227X0010 S2	2	CAPACITOR, FXD, 220 UF 20%, 10 VDCW 56289 184-7419-000	C4	1	
	40	600D605F200D D4	2	CAPACITOR, FXD, 6 UF P50M10%, 200 VDCW 56289 183-1277-570	C6	1	
R	41	777-7904-001	2	RECEIVER BOARD P SEE FIG. 1107 USE UNTIL EXHAUSTED	Z1	1	
R	41	777-7904-002	2	RECEIVER BOARD P SEE FIG. 1107 REPLACES 777-7904-001	Z1	1	
	1102 - 0	768-9083-001	1	18 MHZ IF SEE FIG. 1101-9 FOR NHA	Z7	REF	
	1	768-7245-001	2	CLIP, ELECTRICAL P		1	
R	2	MS16535-51	2	RIVET, TUBULAR, CAD. PL STL, 0.089 DIA X 3/32 LG SHK 305-0146-000 AP		1	
R	3		2	DELETED			
R	4		2	DELETED			
	5	S289-7024-01 0	2	XTAL UNIT, QTZ, 18.49850 MHZ 94148 289-7024-010	Z7Y1	1	
	6	DM10E330J	2	CAPACITOR, FXD, 33 PF 5%, 500 VDCW 72136 912-3848-000	Z7C21	1	
	7	1025-62	2	COIL, RF, 56 UH 99800 240-2044-000	Z7L4	1	
	8	RC07GF562K	2	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	Z7R18	1	
	9	DM10F221J	2	CAPACITOR, FXD, 220 PF 5%, 500 VDCW 72136 912-3903-000	Z7C22	1	
	10	2N918	2	TRANSISTOR 352-0440-000	Z7Q3	1	
	11	150D225X0020 A2	2	CAPACITOR, FXD, 2.2 UF 20%, 20 VDCW 56289 184-7377-000	Z7C15	1	
	12	RC07GF472K	2	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z7R13	1	
	13	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z7C11	1	
	14	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z7C10	1	
	15	RC07GF470K	2	RESISTOR, FXD, 47 OHMS 10%, 1/4 W 745-0701-000	Z7R9	1	
	16	RC07GF152K	2	RESISTOR, FXD, 1500 OHMS 10%, 1/4 W 745-0755-000	Z7R7	1	
	17	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z7R8	1	
	18	RC07GF122K	2	RESISTOR, FXD, 1200 OHMS 10%, 1/4 W 745-0752-000	Z7R6	1	
	19	2N3337	2	TRANSISTOR 352-0697-010	Z7Q2	1	

GROUP ASSEMBLY PARTS LIST



8 MHz IF
Figure 1102

GROUP ASSEMBLY PARTS LIST

	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1102	20	538002B2P093 R	2	CAPACITOR, VAR, 7 TO 25 PF, 350 VDCW 72982 917-1233-000	Z7C4	1	
	21	2N3823	2	TRANSISTOR 352-0706-010	Z7Q1	1	
	22	538002E2P094 R	2	CAPACITOR, VAR, 9 TO 35 PF, 200 VDCW 72982 917-1235-000	Z7C1	1	
	23	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z7C24	1	
	24	1025-62	2	COIL, RF, 56 UH 99800 240-2044-000	Z7L5	1	
	25	RC07GF101K	2	RESISTOR, FXD, 100 OHMS 10%, 1/4 W 745-0713-000	Z7R15	1	
R	26	192P1039R8	2	CAPACITOR, FXD, 0.01 UF 10%, 80 VDCW 56289 933-1039-170 EFF THRU MCN 899	Z7C17	1	
R	26	2C067103X010 1A3	2	CAPACITOR, FXD, 0.01 UF 20%, 100 VDCW 56289 913-4240-100 EFF MCN 900	Z7C17	1	
	27	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z7R14	1	
R	28	192P1039R8	2	CAPACITOR, FXD, 0.01 UF 10%, 80 VDCW 56289 933-1039-170 EFF THRU MCN 899	Z7C13	1	
R	28	2C067103X010 1A3	2	CAPACITOR, FXD, 0.01 UF 20%, 100 VDCW 56289 913-4240-100 EFF MCN 900	Z7C13	1	
R	29	2N918	2	TRANSISTOR 352-0440-000	Z7Q4	1	
	30	1025-30	2	COIL, RF, 2.70 UH 99800 240-2028-000	Z7L3	1	
	31	RC07GF470K	2	RESISTOR, FXD, 47 OHMS 10%, 1/4 W 745-0701-000	Z7R12	1	
R	32	192P1229R8	2	CAPACITOR, FXD, 0.0012 UF 10%, 80 VDCW 56289 933-1039-280 EFF THRU MCN 899	Z7C19	1	
R	32	CK15M122M	2	CAPACITOR, FXD, 1200 OHMS 20%, 50 VDCW 90634 913-4496-240 EFF MCN 900	Z7C19	1	
	33	40C73A1	2	CAPACITOR, FXD, 1000 PF 20%, 500 VDCW 01939 913-3009-000	Z7C20	1	
R	34	192P3329R8	2	CAPACITOR, FXD, 0.0033 UF 10%, 80 VDCW 56289 933-1039-140 EFF THRU MCN 899	Z7C18	1	
R	34	2C067332X010 1A3	2	CAPACITOR, FXD, 0.0033 UF 20%, 100 VDCW 56289 913-4240-150 EFF MCN 900	Z7C18	1	
	35	RC07GF562K	2	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	Z7R19	1	
	36	RC07GF103K	2	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z7R16	1	
	37	RC07GF103K	2	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z7R17	1	
	38	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z7C12	1	
	39	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z7C23	1	
	40	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z7C14	1	
	41	RC07GF472K	2	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z7R10	1	

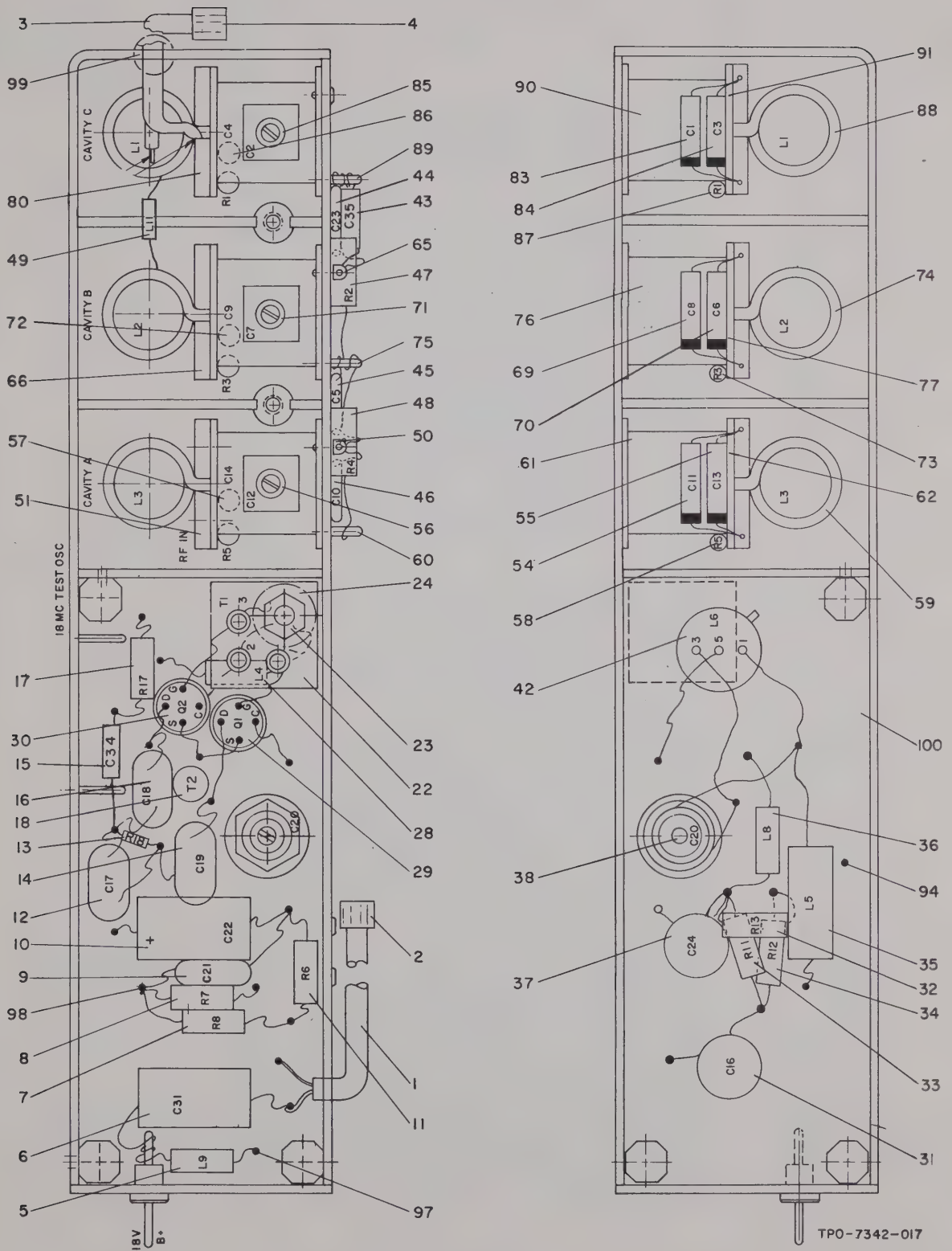
GROUP ASSEMBLY PARTS LIST

	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
	1102 42	RC07GF472K	2	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z7R11	1	
	43	RC07GF391K	2	RESISTOR, FXD, 390 OHMS 10%, 1/4 W 745-0734-000	Z7R20	1	
	44	1N962B	2	SEMICOND DEVICE, ZENER DIO, 11 V 5% 353-3173-000	Z7VR1	1	
	45	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z7C16	1	
	46	CK15M103M	2	CAPACITOR, FXD, 68,000 PF 20%, 50 VDCW 86335 913-4496-130	Z7C26	1	
	47	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z7C9	1	
	48	RC07GF182K	2	RESISTOR, FXD, 1800 OHMS 10%, 1/4 W 745-0758-000	Z7R3	1	
	49	1N746A	2	SEMICOND DEVICE, ZENER DIO, 3.3 V 5% 353-2938-000	Z7VR2	1	
	50	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z7C25	1	
	51	RC07GF392K	2	RESISTOR, FXD, 3900 OHMS 10%, 1/4 W 745-0770-000	Z7R22	1	
R	52	RN55D1622F	2	RESISTOR, FXD, 16,200 OHMS 1%, 1/8 W 705-1054-000 EFF THRU MCN 149	Z7R1	1	
R	52	N55D3651F	2	RESISTOR, FXD, 3650 OHMS 1%, 1/8 W 705-1023-000 EFF MCN 150	Z7R1	1	
	53	1025-62	2	COIL, RF, 56 MH 99800 240-2044-000	Z7L6	1	
	54	RC07GF471K	2	RESISTOR, FXD, 470 OHMS 10%, 1/4 W 745-0737-000	Z7R5	1	
	55	A110	2	COIL, RF, 4 UH 81815 240-2714-010	Z7L1	1	
	56	CK12AX102M	2	CAPACITOR, FXD, 1000 PF 20%, 100 VDCW 913-3019-000	Z7C2	1	
	57	RN55D9091F	2	RESISTOR, FXD, 9090 OHMS 1%, 1/8 W 705-1042-000	Z7R21	1	
	58	772-0990-001	2	TRANSFORMER P	Z7T1	1	
	59	40C73A1	2	CAPACITOR, FXD, 1000 PF 20%, 500 VDCW 01939 913-3009-000	Z7C7	1	
	60	40C73A1	2	CAPACITOR, FXD, 1000 PF 20%, 500 VDCW 01939 913-3009-000	Z7C8	1	
R	60A	DM10C030D0	2	CAPACITOR, FXD, 3 PF 0.5 PF, 500 VDCW 14655 912-3835-000	Z7C28	1	
	61	RC07GF472K	2	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z7R23	1	
	62	D6729	2	SEMICOND DEVICE 93332 353-3659-010	Z7CR1	1	
	63	1025-48	2	COIL, RF, 15 MH 99800 240-2037-000	Z7L2	1	
	64	RC07GF562K	2	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	Z7R2	1	
	65	VC21GY	2	CAPACITOR, VAR, 0.8 TO 4.5 PF, 1000 VDCW 73899 922-0415-000	Z7C5	1	
	66	4021H0TTINNED	2	TERMINAL 77147 304-0087-000		1	
	- 67	778-5205-001	2	INSULATOR, BUSH. AP FOR 65 AND 66		1	
	- 68	302-0516-000	2	WASHER, NM, PLSTC, 0.198 ID, 0.375 OD COML AP FOR 65 AND 66		1	
	- 69	506-5927-003	2	WASHER AP FOR 65 AND 66		1	
	70	RC07GF222K	2	RESISTOR, FXD, 2000 OHMS 10%, 1/4 W 745-0761-000	Z7R4	1	

GROUP ASSEMBLY PARTS LIST

	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1102	71	192P1039R8	2	CAPACITOR, FXD, 0.01 UF 10%, 80 VDCW 56289 933-1039-170	Z7C3	1	
	72	805-014X5V01 03Z	2	CAPACITOR, FXD, 0.01 UF P80M20%, 100 VDCW 72982 913-3680-000	Z7C27	1	
	73	1N457	2	SEMICOND DEVICE 353-0204-000	Z7CR2	1	
	74	F22NCFMA1-26	2	NUT, SELF-LKG, CLINCH, CAD. PL STL, 2-56 72962 333-0837-000		3	
R	75	AB404D	2	TERMINAL 12615 306-1309-000		1	
	- 76	MS35649-24	2	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP		2	
	- 77	MS35338-134	2	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP		2	
	78	AB406D	2	TERMINAL 12615 306-1311-000		6	
R	- 79	P313-0484-01 0	2	NUT, PLAIN, HEX., NI PL BRS, 2-56 77250 313-0484-000 AP		7	
R	- 80	MS35338-134	2	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP		7	
	81	SL180-231	2	TERMINAL 12615 306-1272-000		18	
	82	SL283-230	2	TERMINAL 12615 306-1265-000		22	
	83	768-7175-001	2	CHASSIS, ELECTRICAL EQUIP. P		1	
1103 -	0	757-0634-001	1	TUNER P SEE FIG. 1101-15 FOR NHA	Z8	REF	
	1	425-1601-000	2	CABLE, 0.50 FT 05973		AR	
	2	031-1066-001	2	CONTACT 71468 372-2519-240		1	
	3	RG196AU	2	CABLE, 0.20 FT 425-1004-000		AR	
	4	031-1066-000	2	CONTACT 71468 372-2519-010		1	
	5	1025-62	2	COIL, RF, 56 UH 99800 240-2044-000	Z8L9	1	
	6	192P1049R8	2	CAPACITOR, FXD, 0.1 UF 10%, 80 VDCW 56289 933-1039-230	Z8C31	1	
	7	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z8R8	1	
	8	RC07GF221K	2	RESISTOR, FXD, 220 OHMS 10%, 1/4 W 745-0725-000	Z8R7	1	
	9	40C73A1	2	CAPACITOR, FXD, 1000 PF 20%, 500 VDCW 01939 913-3009-000	Z8C21	1	
	10	192P1049R8	2	CAPACITOR, FXD, 0.1 UF 10%, 80 VDCW 56289 933-1039-230	Z8C22	1	
	11	RC07GF151J	2	RESISTOR, FXD, 150 OHMS 5%, 1/4 W 745-0718-000	Z8R6	AR	
	11	RC07GF161J	2	RESISTOR, FXD, 160 OHMS 5%, 1/4 W 745-0720-000	Z8R6	AR	
	11	RC07GF181J	2	RESISTOR, FXD, 180 OHMS 5%, 1/4 W 745-0721-000	Z8R6	AR	
	11	RC07GF201J	2	RESISTOR, FXD, 200 OHMS 5%, 1/4 W 745-0723-000	Z8R6	AR	
	11	RC07GF221J	2	RESISTOR, FXD, 220 OHMS 5%, 1/4 W 745-0724-000	Z8R6	AR	
	11	RC07GF241J	2	RESISTOR, FXD, 240 OHMS 5%, 1/4 W 745-0726-000	Z8R6	AR	
	11	RC07GF271J	2	RESISTOR, FXD, 270 OHMS 5%, 1/4 W 745-0727-000	Z8R6	AR	

GROUP ASSEMBLY PARTS LIST



Tuner
Figure 1103

GROUP ASSEMBLY PARTS LIST

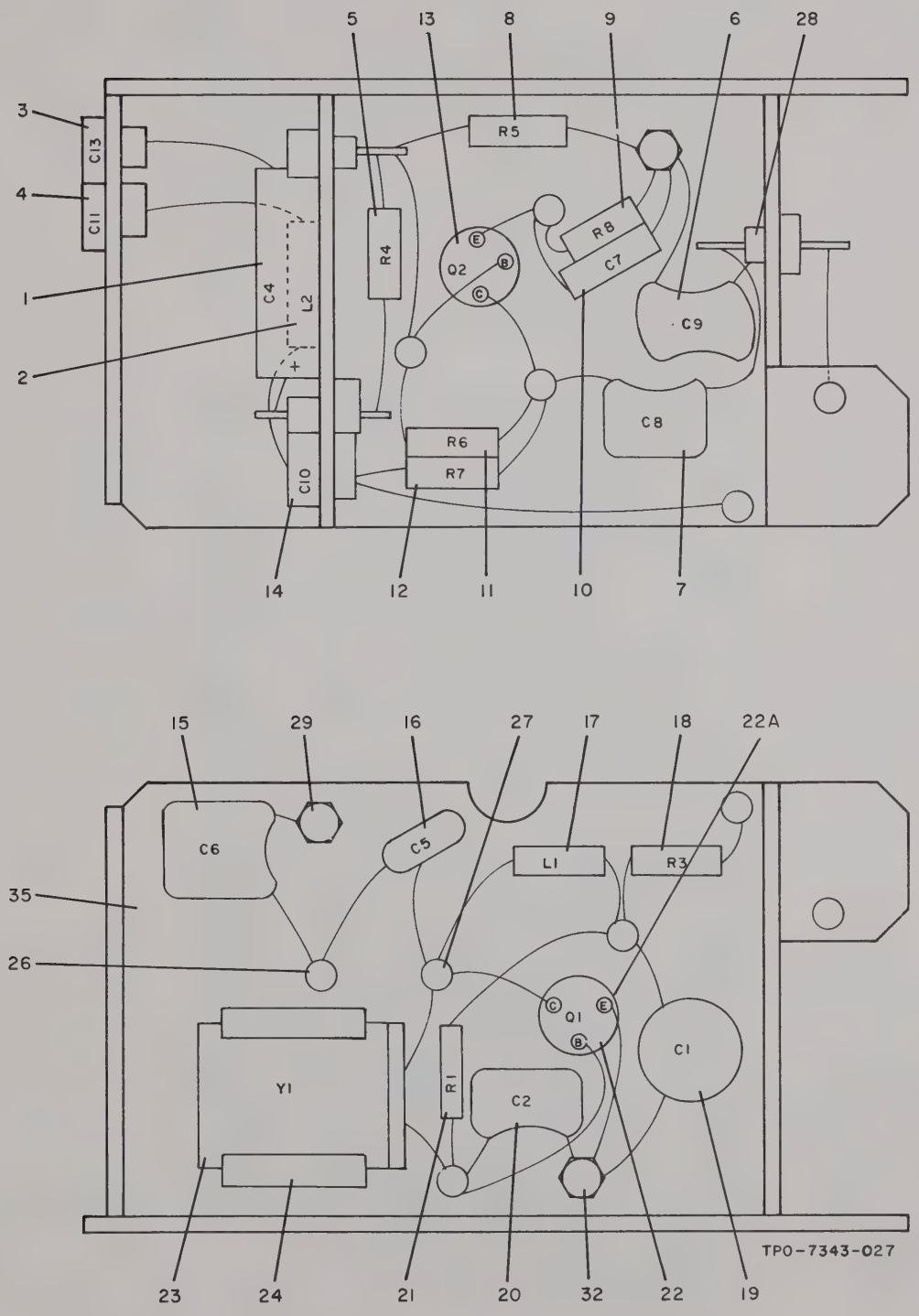
	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1103	11	RC07GF301J	2	RESISTOR, FXD, 300 OHMS 5%, 1/4 W 745-0729-000	Z8R6	AR	
	11	RC07GF331J	2	RESISTOR, FXD, 330 OHMS 5%, 1/4 W 745-0730-000	Z8R6	AR	
	11	RC07GF361J	2	RESISTOR, FXD, 360 OHMS 5%, 1/4 W 745-0732-000	Z8R6	AR	
	11	RC07GF391J	2	RESISTOR, FXD, 390 OHMS 5%, 1/4 W 745-0733-000	Z8R6	AR	
	11	RC07GF431J	2	RESISTOR, FXD, 430 OHMS 5%, 1/4 W 745-0735-000	Z8R6	AR	
	11	RC07GF471J	2	RESISTOR, FXD, 470 OHMS 5%, 1/4 W 745-0736-000	Z8R6	AR	
	12	DM10E300J	2	CAPACITOR, FXD, 30 PF 5%, 500 VDCW 72136 912-3846-000	Z8C17	1	
	13	RC07GF123K	2	RESISTOR, FXD, 12,000 OHMS 10%, 1/4 W 745-0788-000	Z8R18	1	
	14	DM10F101J	2	CAPACITOR, FXD, 100 PF 5%, 500 VDCW 72136 912-3879-000	Z8C19	1	
	15	TC20-101	2	CAPACITOR, FXD, 20 PF 5%, 100 VDCW 86335 913-3112-470	Z8C34	1	
	16	DM10C050J	2	CAPACITOR, FXD, 5 PF 5%, 500 VDCW 72136 912-3836-000	Z8C18	1	
R	17	RC07GF563K	2	RESISTOR, FXD, 56,000 OHMS 10%, 1/4 W 745-0812-000 EFF THRU MCN 150	Z8R17	1	
	18	777-7200-001	2	TRANSFORMER	Z8T2	1	
	- 19	MS35649-24	2	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP		1	
	- 20	302-0509-000	2	WASHER, NM, POLYPHENYLENE OXIDE, 0.078 ID, 0.186 OD COML AP		2	
	- 21	P330-2247-000	2	SCREW, MACH., NYLON, 2-56 X 1/4 77250 330-2247-000 AP		1	
	22	763-8177-001	2	TERMINAL BOARD P		1	
	23	A105	2	TRANSFORMER 81815 278-2098-010	Z8T1	1	
	24	763-8179-001	2	SPACER, SLV		1	
	- 25	MS35649-24	2	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP FOR 22 THRU 24		1	
	- 26	302-0509-000	2	WASHER, NM, POLYPHENYLENE OXIDE, 0.078 ID, 0.186 OD COML AP FOR 22 THRU 24		1	
	- 27	N256	2	SCREW, MACH., NYLON, 2-56 X 1 95987 330-3052-010 AP FOR 22 THRU 24		1	
	28	1025-30	2	COIL, RF, 2.70 UH 99800 240-2028-000	Z8L4	1	
	29	2N4416	2	TRANSISTOR 352-0756-010	Z8Q1	1	
	30	2N4416	2	TRANSISTOR 352-0756-010	Z8Q2	1	
	31	19C372	2	CAPACITOR, FXD, 470 PF 20%, 500 VDCW 01939 913-3007-000	Z8C16	1	
	32	RC07GF221K	2	RESISTOR, FXD, 220 OHMS 10%, 1/4 W 745-0725-000	Z8R13	1	
	33	RC07GF121K	2	RESISTOR, FXD, 120 OHMS 10%, 1/4 W 745-0716-000	Z8R11	1	
	34	RC07GF390K	2	RESISTOR, FXD, 39 OHMS 10%, 1/4 W 745-0698-000	Z8R12	1	
	35	MS90539-15	2	COIL, RF, 1000 UH 240-2540-000	Z8L5	1	
	36	1025-04	2	COIL, RF, 0.22 MH 99800 240-2015-000	Z8L8	1	

GROUP ASSEMBLY PARTS LIST

	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1103	37	19C372	2	CAPACITOR, FXD, 470 PF 20%, 500 VDCW 01939 913-3007-000	Z8C24	1	
	38	VC21GY	2	CAPACITOR, VAR, 0.8 TO 4.5 PF, 1000 VDCW 73899 922-0415-000	Z8C20	1	
	- 39	506-5927-003	2	WASHER AP		1	
	- 40	778-5205-001	2	INSULATOR, BUSH. AP		1	
	- 41	302-0516-000	2	WASHER, NM, PLSTC, 0.198 ID, 0.375 OD COML AP		1	
	42	A110	2	COIL, RF, 4 UH 81815 240-2714-010	Z8L6	1	
	43	150D1696	2	CAPACITOR, FXD, 10 UF 10%, 20 VDCW 56289 184-9063-400	Z8C35	1	
	44	19C372	2	CAPACITOR, FXD, 470 PF 20%, 500 VDCW 01939 913-3007-000	Z8C23	1	
	45	19C372	2	CAPACITOR, FXD, 470 PF 20%, 500 VDCW 01939 913-3007-000	Z8C5	1	
	46	19C372	2	CAPACITOR, FXD, 470 PF 20%, 500 VDCW 01939 913-3007-000	Z8C10	1	
	47	RC07GF223K	2	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000	Z8R2	1	
	48	RC07GF223K	2	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000	Z8R4	1	
	49	MS18130-10	2	COIL, RF, 1.50 UH 240-1570-000	Z8L11	1	
R	50	4007-4	2	TERMINAL 77147 304-0015-000		1	
	51	778-5399-001	2	FILTER		1	
R	- 52	92-1660-26	2	NUT, SELF-LKG, CAD, PL BRS, 2-56 72962 333-1405-030 AP FOR 50 AND 51		3	
R	- 52A	310-6320-000	2	WASHER, FLAT, SST, 0.092 ID, 0.092 OD COML AP FOR 50 AND 51		3	
R	- 53	MS51957-3	2	SCREW, MACH., SST, PAN HD, 2-56 X 1/4 343-0124-000 AP FOR 50 AND 51		3	
	54	CK12AX102M	3	CAPACITOR, FXD, 1000 PF 20%, 100 VDCW 913-3019-000	Z8C11	1	
	55	MA4394	3	CAPACITOR, VOLT, 10 PF 1 PF, -30 VDCW 96341 922-6074-000	Z8C13	1	
	56	JMC2903	3	CAPACITOR, VAR, 1 TO 10 PF, 500 VDCW 91293 922-0583-040	Z8C12	1	
	57	CK12AX102M	3	CAPACITOR, FXD, 1000 PF, 20%, 100 VDCW 913-3019-000	Z8C14	1	
	58	RC07GF104K	3	RESISTOR, FXD, 0.10 MEG 10%, 1/4 W 745-0821-000	Z8R5	1	
	59	778-5398-001	3	COIL, RF	Z8L3	1	
	60	SL324-231	3	TERMINAL 12615 306-1274-000		1	
	61	768-7243-001	3	BRACKET, MTG		1	
	62	768-1960-001	3	TRIMMER BOARD P		1	
	- 63	SE24CADPL	3	EYELET, MET. CAD. PL BRS, 0.062 DIA X 0.125 LG BBL 90030 307-1053-000 AP FOR 61 AND 62		2	
	- 64	310-0128-000	3	WASHER, FLAT, SIL PL BRS, 0.067 ID, 0.125 OD COML AP FOR 61 AND 62		2	
	65	4040-2HOTTIN NED	2	TERMINAL 77147 304-0014-000		1	
	66	772-0789-001	2	FILTER P		1	
	- 67	68-1660-26	2	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0604-000 AP FOR 65 AND 66		1	

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1103 - 68	MS51957-2	2	SCREW, MACH., SST, PAN HD, 2-56 X 3/16 343-0123-000 AP FOR 65 AND 66		1	
69	MA4394	3	CAPACITOR, VOLT, 10 PF 1 PF, -30 VDCW 96341 922-6074-000	Z8C8	1	
70	MA4394	3	CAPACITOR, VOLT, 10 PF 1 PF, -30 VDCW 96341 922-6074-000	Z8C6	1	
71	JMC2903	3	CAPACITOR, VAR, 1 TO 10 PF, 500 VDCW 91293 922-0583-040	Z8C7	1	
72	CK12AX102M	3	CAPACITOR, FXD, 1000 PF 20%, 100 VDCW 913-3019-000	Z8C9	1	
73	RC07GF104K	3	RESISTOR, FXD, 0.10 MEG 10%, 1/4 W 745-0821-000	Z8R3	1	
74	772-0746-001	3	COIL P	Z8L2	1	
75	SL324-231	3	TERMINAL 12615 306-1274-000		1	
76	768-7243-001	3	BRACKET, MTG		1	
77	768-1960-001	3	TRIMMER BOARD P		1	
- 78	SE24CADPL	3	EYELET, MET. CAD. PL BRS, 0.062 DIA X 0.125 LG BBL 90030 307-1053-000 AP FOR 76 AND 77		2	
- 79	310-0128-000	3	WASHER, FLAT, SIL PL BRS, 0.067 ID, 0.125 OD COML AP FOR 76 AND 77		2	
80	772-0789-001	2	FILTER P		1	
- 81	68-1660-26	2	NUT, SELF-LKG, HEX., AL, 2-56 72962 333-0604-000 AP		1	
- 82	MS51957-2	2	SCREW, MACH., SST, PAN HD, 2-56 X 3/16 343-0123-000 AP		1	
83	MA4394	3	CAPACITOR, VOLT, 10 PF 1 PF, -30 VDCW 96341 922-6074-000	Z8C1	1	
84	MA4394	3	CAPACITOR, VOLT, 10 PF 1 PF, -30 VDCW 96341 922-6074-000	Z8C3	1	
85	JMC2903	3	CAPACITOR, VAR, 1 TO 10 PF, 500 VDCW 91293 922-0583-040	Z8C2	1	
86	CK12AX102M	3	CAPACITOR, FXD, 1000 PF 20%, 100 VDCW 913-3019-000	Z8C4	1	
87	RC07GF104K	3	RESISTOR, FXD, 0.10 MEG 10%, 1/4 W 745-0821-000	Z8R1	1	
88	772-0746-001	3	COIL P	Z8L1	1	
89	SL324-231	3	TERMINAL 12615 306-1274-000		1	
90	768-7243-001	3	BRACKET, MTG		1	
91	768-1960-001	3	TRIMMER BOARD P		1	
- 92	SE24CADPL	3	EYELET, MET. CAD. PL BRS, 0.062 DIA X 0.125 LG BBL 90030 307-1053-000 AP FOR 90 AND 91		2	
- 93	310-0128-000	3	WASHER, FLAT, SIL PL BRS, 0.067 ID, 0.125 OD COML AP FOR 90 AND 91		2	
94	AB406D	2	TERMINAL 12615 306-1311-000		4	
- 95	MS35649-24	2	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP		4	
- 96	MS35338-134	2	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP		4	
R 97	SL157-197	2	TERMINAL 12615 306-1260-000		7	
98	SL158-198	2	TERMINAL 12615 306-1270-000		8	
99	SE43CADPL	2	EYELET, MET., BRS, 0.123 DIA X 0.093 LG BBL 07707 307-9001-000		1	
100	768-7178-001	2	CHASSIS P		1	



Test Oscillator
Figure 1104

GROUP ASSEMBLY PARTS LIST

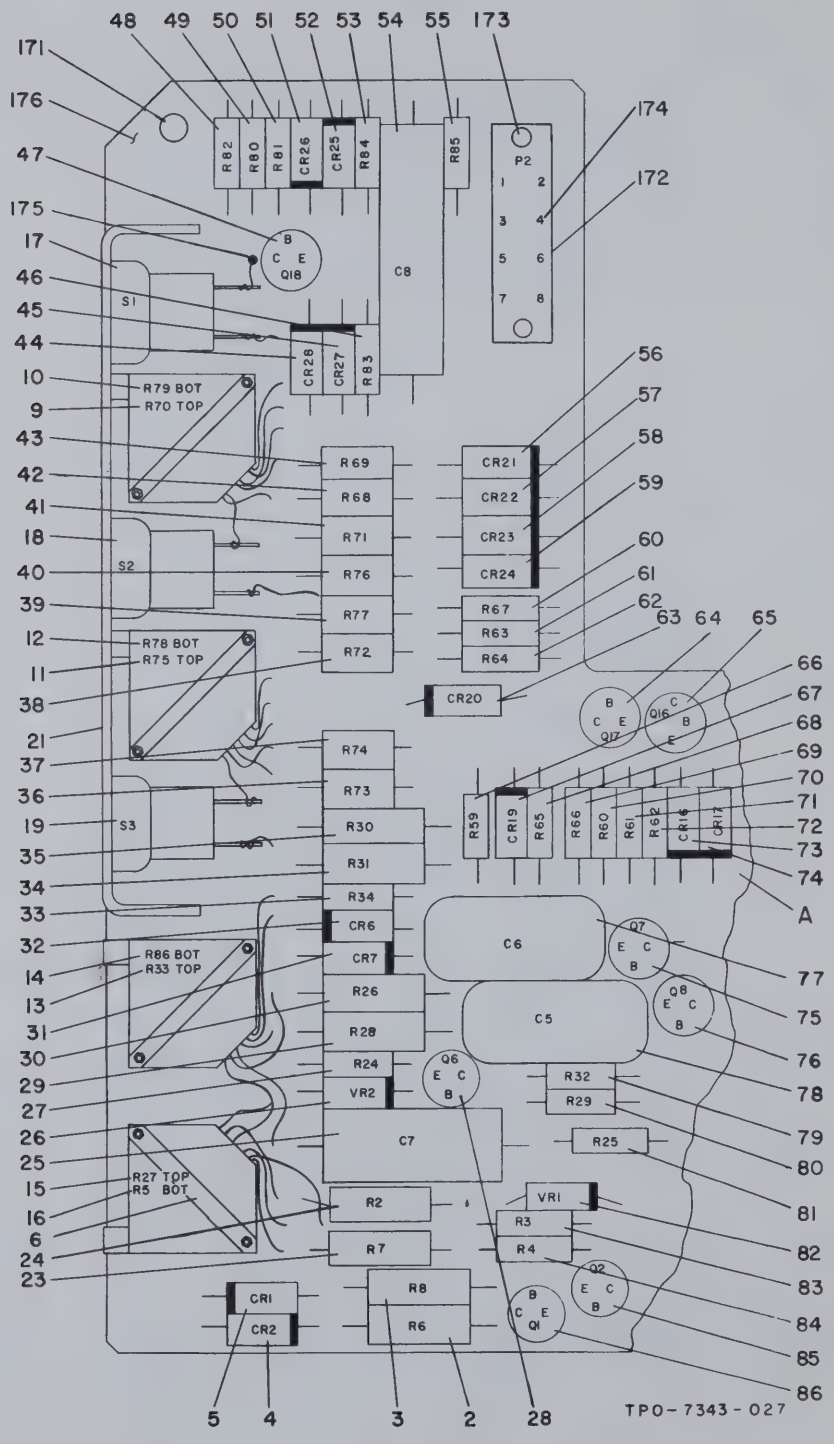
	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1104 -	0	768-9039-001	1	TEST OSCILLATOR P SEE FIG. 1101-18 FOR NHA	Z9	REF	
	1	150D685X0006 A2	2	CAPACITOR, FXD, 6.8 UF 20%, 6 VDCW 56289 184-7378-000	Z9C4	1	
	2	1025-62	2	COIL, RF, 56 UH 99800 240-2044-000	Z9L2	1	
	3	DA718-001	2	CAPACITOR, FXD, 500 PF, 250 VDCW 71590 913-3018-000	Z9C13	1	
	4	DA718-001	2	CAPACITOR, FXD, 500 PF, 250 VDCW 71590 913-3018-000	Z9C11	1	
	5	RC07GF122K	2	RESISTOR, FXD, 1200 OHMS 10%, 1/4 W 745-0752-000	Z9R4	1	
R	6	4C1225BH3	2	CAPACITOR, FXD, 1200 PF 5%, 50 VDCW 56289 913-5384-000 EFF THRU MCN 150	Z9C9	1	
R	6	CM04FD271J03	2	CAPACITOR, FXD, 270 PF 5%, 300 VDCW 912-3909-000 EFF MCN 151	Z9C9	1	
	7	DM10E220J	2	CAPACITOR, FXD, 22 PF 5%, 500 VDCW 72136 912-3842-000	Z9C8	1	
	8	RC07GF333K	2	RESISTOR, FXD, 33,000 OHMS 10%, 1/4 W 745-0803-000	Z9R5	1	
	9	RC07GF182K	2	RESISTOR, FXD, 1800 OHMS 10%, 1/4 W 745-0758-000	Z9R8	1	
	10	CK12AX102M	2	CAPACITOR, FXD, 1000 PF 20%, 100 VDCW 913-3019-000	Z9C7	1	
	11	RC07GF823K	2	RESISTOR, FXD, 82,000 OHMS 10%, 1/4 W 745-0818-000	Z9R6	1	
	12	RC07GF562K	2	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	Z9R7	1	
	13	2N918	2	TRANSISTOR 352-0440-000	Z9Q2	1	
	14	DA718-001	2	CAPACITOR, FXD, 500 PF, 250 VDCW 71590 913-3018-000	Z9C10	1	
	15	DM15F511K03	2	CAPACITOR, FXD, 510 PF 10%, 300 VDCW 72136 912-2868-000	Z9C6	1	
	16	DM10F560J	2	CAPACITOR, FXD, 56 PF 5%, 500 VDCW 72136 912-3861-000	Z9C5	1	
	17	1025-34	2	COIL, RF, 3.90 UH 99800 240-2030-000	Z9L1	1	
	18	RC07GF562K	2	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	Z9R3	1	
	19	40C73A1	2	CAPACITOR, FXD, 1000 PF 20%, 500 VDCW 01939 913-3009-000	Z9C1	1	
	20	DM10F221J	2	CAPACITOR, FXD, 220 PF 5%, 500 VDCW 72136 912-3903-000	Z9C2	1	
	21	RC07GF103K	2	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z9R1	1	
	22	2N918	2	TRANSISTOR 352-0440-000	Z9Q1	1	
R	22A	XB021767-3	2	INSULATOR 98291 352-9800-050		1	
	23	S289-1585-000	2	XTAL UNIT, QTZ, 16,300.00 MHZ 94148 289-1585-000	Z9Y1	1	
	24	504-8229-001	2	CLIP, ELECTRICAL		1	
	- 25	MS16535-75	2	RIVET, TUBULAR, AL, 0.089 DIA X 0.094 LG SHK 305-1754-000 AP		1	
	26	SL324-231	2	TERMINAL 12615 306-1274-000		3	
	27	SL283-230	2	TERMINAL 12615 306-1265-000		6	
	28	SL158-198	2	TERMINAL 12615 306-1270-000		1	
	29	AB404D	2	TERMINAL 12615 306-1309-000		2	
	- 30	MS35649-24	2	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP		2	

GROUP ASSEMBLY PARTS LIST

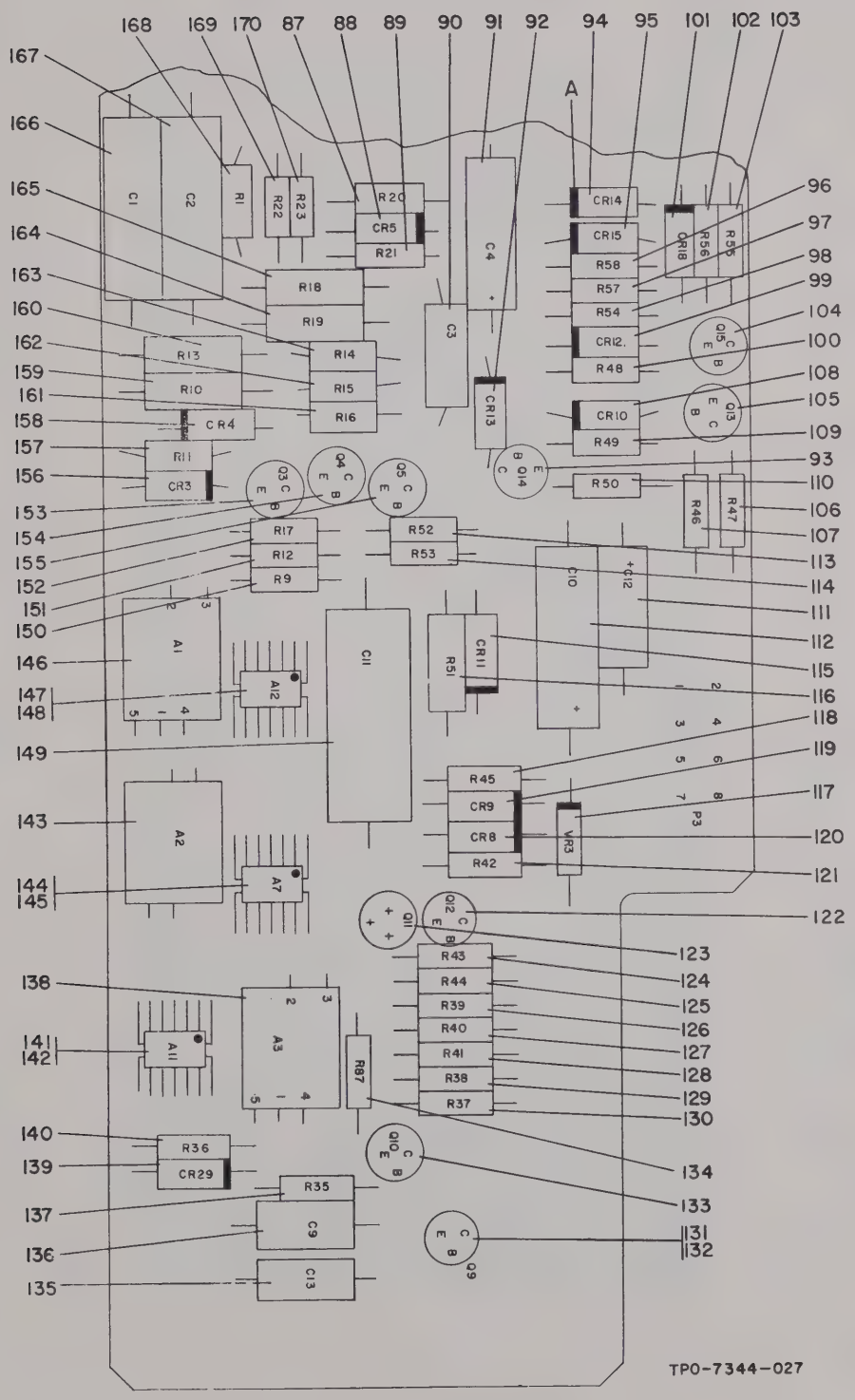
	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1104	- 31	MS35338-134	2	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP		2	
	32	AB406D	2	TERMINAL 12615 306-1311-000		1	
	- 33	MS35649-24	2	NUT, PLAIN, HEX., SST, 2-56 313-0037-000 AP		1	
	- 34	MS35338-134	2	WASHER, LOCK, SST, 0.088 ID, 0.175 OD 310-0275-000 AP		1	
	35	768-9058-001	2	CHASSIS, ELECTRICAL EQUIP. P		1	
R 1105	- 0	778-5001-001	1	TEST GENERATOR P SEE FIG. 1101-21 FOR NHA	Z2	REF	A
R	0	778-5001-002	1	TEST GENERATOR P SEE FIG. 1101-21 FOR NHA	Z2	REF	B
	* 1	778-5002-001	2	TEST GENERATOR P		1	
R	* 2	MF1-10 39200 FT1	3	RESISTOR, FXD, 3920 OHMS 1%, 1/10 W 91637 705-1468-220	Z2R6	1	
	3	RN60C1002F	3	RESISTOR, FXD, 10,000 OHMS 1%, 1/8 W 705-6297-000	Z2R8	1	
	4	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR2	1	
	5	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR1	1	
	6	756-7045-002	3	STRAP		4	
R	- 7	P343-0465-00 0	3	SCREW, MACH., CAD. PL STL, PAN HD, 2-56 X 9/16 77250 343-0465-000 AP		6	
R	- 8	P342-1359-01 0	3	SCREW, MACH., SST, FH, 2-56 X 9/16 77250 342-1359-010 AP		2	
	9	3250LC10-103	3	RESISTOR, VAR, 10,000 OHMS 5%, 1 W 80294 381-1846-100	Z2R70	1	
	10	3250LC10-103	3	RESISTOR, VAR, 10,000 OHMS 5%, 1 W 80294 381-1846-100	Z2R79	1	
	11	3250LC10-103	3	RESISTOR, VAR, 10,000 OHMS 5%, 1 W 80294 381-1846-100	Z2R75	1	
	12	3250LC10-103	3	RESISTOR, VAR, 10,000 OHMS 5%, 1 W 80294 381-1846-100	Z2R78	1	
	13	3250LC10-502	3	RESISTOR, VAR, 5000 OHMS 5%, 1 W 80294 381-1846-090	Z2R33	1	
	14	3250LC10-500	3	RESISTOR, VAR, 50 OHMS 5%, 1 W 80294 381-1846-030	Z2R86	1	
	15	3250LC10-501	3	RESISTOR, VAR, 500 OHMS 5%, 1 W 80294 381-1846-060	Z2R27	1	
R	* 16	3250LC10-202	3	RESISTOR, VAR, 2000 OHMS 5%, 1 W 80294 381-1846-080	Z2R5	1	
	17	30-1	3	SWITCH 81073 260-2709-000	Z2S1	1	
	18	30-1	3	SWITCH 81073 260-2709-000	Z2S2	1	
	19	30-1	3	SWITCH 81073 260-2709-000	Z2S3	1	
	- 20	768-7242-001	3	NUT, PLAIN, RD P AP FOR 17 THRU 19		3	
	21	768-7106-001	3	BRACKET, SWITCH P		1	
	- 22	MS51957-2	3	SCREW, MACH., SST, PAN HD, 2-56 X 3/16 343-0123-000 AP		2	

*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST



Test Generator (Sheet 1 of 2)
Figure 1105



Test Generator (Sheet 2 of 2)
Figure 1105

GROUP ASSEMBLY PARTS LIST

	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1105	23	RN60C1002F	3	RESISTOR, FXD, 10,000 OHMS 1%, 1/8 W 705-6297-000	Z2R7	1	
R *	24	MF1-10 13300 F	3	RESISTOR, FXD, 1330 OHMS 1%, 1/8 W 91637 705-1454-420	Z2R2	1	
	25	192P2249R8	3	CAPACITOR, FXD, 0.22 UF 10%, 80 VDCW 56289 933-1039-250	Z2C7	1	
	26	JAN1N746A	3	SEMICOND DEVICE 353-2973-000	Z2VR2	1	
	27	RC07GF271K	3	RESISTOR, FXD, 270 OHMS 10%, 1/4 W 745-0728-000	Z2R24	1	
	28	2N956	3	TRANSISTOR 352-0400-010	Z2Q6	1	
	29	RN60C1001F	3	RESISTOR, FXD, 1000 OHMS 1%, 1/8 W 705-6273-000	Z2R28	1	
	30	RN60C3830F	3	RESISTOR, FXD, 383 OHMS 1%, 1/8 W 705-6263-000	Z2R26	1	
	31	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR7	1	
	32	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR6	1	
	33	RC07GF682K	3	RESISTOR, FXD, 6800 OHMS 10%, 1/4 W 745-0779-000	Z2R34	1	
	34	RN60C1212F	3	RESISTOR, FXD, 12,100 OHMS 1%, 1/8 W 705-6299-000	Z2R31	1	
	35	RN60C1212F	3	RESISTOR, FXD, 12,100 OHMS 1%, 1/8 W 705-6299-000	Z2R30	1	
	36	RN55D1332F	3	RESISTOR, FXD, 13,300 OHMS 1%, 1/8 W 705-1050-000	Z2R73	1	
	37	RN55D5111F	3	RESISTOR, FXD, 5110 OHMS 1%, 1/8 W 705-1030-000	Z2R74	1	
	38	RN55D5111F	3	RESISTOR, FXD, 5110 OHMS 1%, 1/8 W 705-1030-000	Z2R72	1	
	39	RN55D5111F	3	RESISTOR, FXD, 5110 OHMS 1%, 1/8 W 705-1030-000	Z2R77	1	
	40	RN55D1332F	3	RESISTOR, FXD, 13,300 OHMS 1%, 1/8 W 705-1050-000	Z2R76	1	
	41	RN55D5621F	3	RESISTOR, FXD, 5620 OHMS 1%, 1/8 W 705-1032-000	Z2R71	1	
	42	RN55D5111F	3	RESISTOR, FXD, 5110 OHMS 1%, 1/8 W 705-1030-000	Z2R68	1	
	43	RN55D5621F	3	RESISTOR, FXD, 5620 OHMS 1%, 1/8 W 705-1032-000	Z2R69	1	
	44	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR28	1	
	45	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR27	1	
	46	RC07GF273K	3	RESISTOR, FXD, 27,000 OHMS 10%, 1/4 W 745-0800-000	Z2R83	1	
	47	2N956	3	TRANSISTOR 352-0400-010	Z2Q18	1	
	48	RN55D1331F	3	RESISTOR, FXD, 1330 OHMS 1%, 1/8 W 705-1002-000	Z2R82	1	
	49	RC07GF392K	3	RESISTOR, FXD, 3900 OHMS 10%, 1/4 W 745-0770-000	Z2R80	1	
	50	RN55D4641F	3	RESISTOR, FXD, 4640 OHMS 1%, 1/8 W 705-1028-000	Z2R81	1	
	51	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR26	1	
	52	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR25	1	
	53	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R84	1	
	54	151D116X9015 X2	3	CAPACITOR, FXD, 11 UF 10%, 15 VDCW 56289 184-8369-000	Z2C8	1	

*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1105	55	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R85	1	
	56	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR21	1	
	57	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR22	1	
	58	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR23	1	
	59	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR24	1	
	60	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R67	1	
	61	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R63	1	
	62	RC07GF272K	3	RESISTOR, FXD, 2700 OHMS 10%, 1/4 W 745-0764-000	Z2R64	1	
	63	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR20	1	
	64	2N956	3	TRANSISTOR 352-0400-010	Z2Q17	1	
	65	2N956	3	TRANSISTOR 352-0400-010	Z2Q16	1	
	66	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R59	1	
	67	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR19	1	
	68	RC07GF472K	3	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z2R65	1	
	69	RC07GF471K	3	RESISTOR, FXD, 470 OHMS 10%, 1/4 W 745-0737-000	Z2R66	1	
	70	RC07GF272K	3	RESISTOR, FXD, 2700 OHMS 10%, 1/4 W 745-0764-000	Z2R60	1	
	71	RC07GF472K	3	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z2R61	1	
	72	RC07GF471K	3	RESISTOR, FXD, 470 OHMS 10%, 1/4 W 745-0737-000	Z2R62	1	
	73	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR16	1	
	74	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR17	1	
	75	2N2907A	3	TRANSISTOR 352-0551-010	Z2Q7	1	
	76	2N2907A	3	TRANSISTOR 352-0551-010	Z2Q8	1	
R	* 77	CM06FD432G03	3	CAPACITOR, FXD, 4300 PF 2%, 500 VDCW 912-3048-000	Z2C6	1	
R	* 78	CM06FD432G03	3	CAPACITOR, FXD, 4300 PF 2%, 500 VDCW 912-3048-000	Z2C5	1	
	79	RC07GF222K	3	RESISTOR, FXD, 2200 OHMS 10%, 1/4 W 745-0761-000	Z2R32	1	
	80	RC07GF222K	3	RESISTOR, FXD, 2200 OHMS 10%, 1/4 W 745-0761-000	Z2R29	1	
	81	RC07GF680K	3	RESISTOR, FXD, 68 OHMS 10%, 1/4 W 745-0707-000	Z2R25	1	
	82	JAN1N746A	3	SEMICOND DEVICE 353-2973-000	Z2VR1	1	
	83	RC07GF222K	3	RESISTOR, FXD, 2200 OHMS 10%, 1/4 W 745-0761-000	Z2R3	1	
	84	RC07GF222K	3	RESISTOR, FXD, 2200 OHMS 10%, 1/4 W 745-0761-000	Z2R4	1	
	85	2N3904	3	TRANSISTOR 352-0722-020	Z2Q2	1	
	86	2N3904	3	TRANSISTOR 352-0722-020	Z2Q1	1	
	87	RN55D1211F	3	RESISTOR, FXD, 1210 OHMS 1%, 1/8 W 705-1000-000	Z2R20	1	
	88	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR5	1	
	89	RN55D1002F	3	RESISTOR, FXD, 10,000 OHMS 1%, 1/8 W 705-1044-000	Z2R21	1	
	90	150D475X0035 B2	3	CAPACITOR, FXD, 4.7 UF 20%, 35 VDCW 56289 184-7396-000	Z2C3	1	

*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1105	91	150D336X0010 B2	3	CAPACITOR, FXD, 33 UF 20%, 10 VDCW 56289 184-7382-000	Z2C4	1	
	92	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR13	1	
	93	2N2907A	3	TRANSISTOR 352-0551-010	Z2Q14	1	
	94	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR14	1	
	95	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR15	1	
	96	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R58	1	
	97	RC07GF822K	3	RESISTOR, FXD, 8200 OHMS 10%, 1/4 W 745-0782-000	Z2R57	1	
	98	RC07GF153K	3	RESISTOR, FXD, 15,000 OHMS 10%, 1/4 W 745-0791-000	Z2R54	1	
	99	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR12	1	
	100	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R48	1	
	101	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR18	1	
	102	RC07GF154K	3	RESISTOR, FXD, 0.15 MEG 10%, 1/4 W 745-0827-000	Z2R56	1	
	103	RC07GF154K	3	RESISTOR, FXD, 0.15 MEG 10%, 1/4 W 745-0827-000	Z2R55	1	
	104	2N956	3	TRANSISTOR 352-0400-010	Z2Q15	1	
	105	2N2907A	3	TRANSISTOR 352-0551-010	Z2Q13	1	
	106	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R47	1	
	107	RC07GF153K	3	RESISTOR, FXD, 15,000 OHMS 10%, 1/4 W 745-0791-000	Z2R46	1	
	108	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR10	1	
	109	RC07GF153K	3	RESISTOR, FXD, 15,000 OHMS 10%, 1/4 W 745-0791-000	Z2R49	1	
	110	RC07GF223K	3	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000	Z2R50	1	
	111	150D475X0035 B2	3	CAPACITOR, FXD, 4.7 UF 20%, 35 VDCW 56289 184-7396-000	Z2C12	1	
	112	109D686X0030 F2	3	CAPACITOR, FXD, 68 UF 20%, 30 VDCW 56289 184-7782-000	Z2C10	1	
	113	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R52	1	
	114	RC07GF104K	3	RESISTOR, FXD, 0.10 MEG 10%, 1/4 W 745-0821-000	Z2R53	1	
	115	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR11	1	
R	*116	MF1-10 16202 F	3	RESISTOR, FXD, 162,000 OHMS, 1%, 1/8 W 91637 705-1454-920	Z2R51	1	
	117	1N754A	3	SEMICOND DEVICE, ZENER DIO, 6.8 V 5% 353-2716-000	Z2VR3	1	
	118	RN55D9092F	3	RESISTOR, FXD, 90,900 OHMS 1%, 1/8 W 705-1090-000	Z2R45	1	
	119	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR9	1	
	120	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR8	1	
	121	RC07GF223K	3	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000	Z2R42	1	
	122	2N956	3	TRANSISTOR 352-0400-010	Z2Q12	1	
	123	2N2907A	3	TRANSISTOR 352-0551-010	Z2Q11	1	
	124	RC07GF223K	3	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000	Z2R43	1	
	125	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R44	1	

*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST

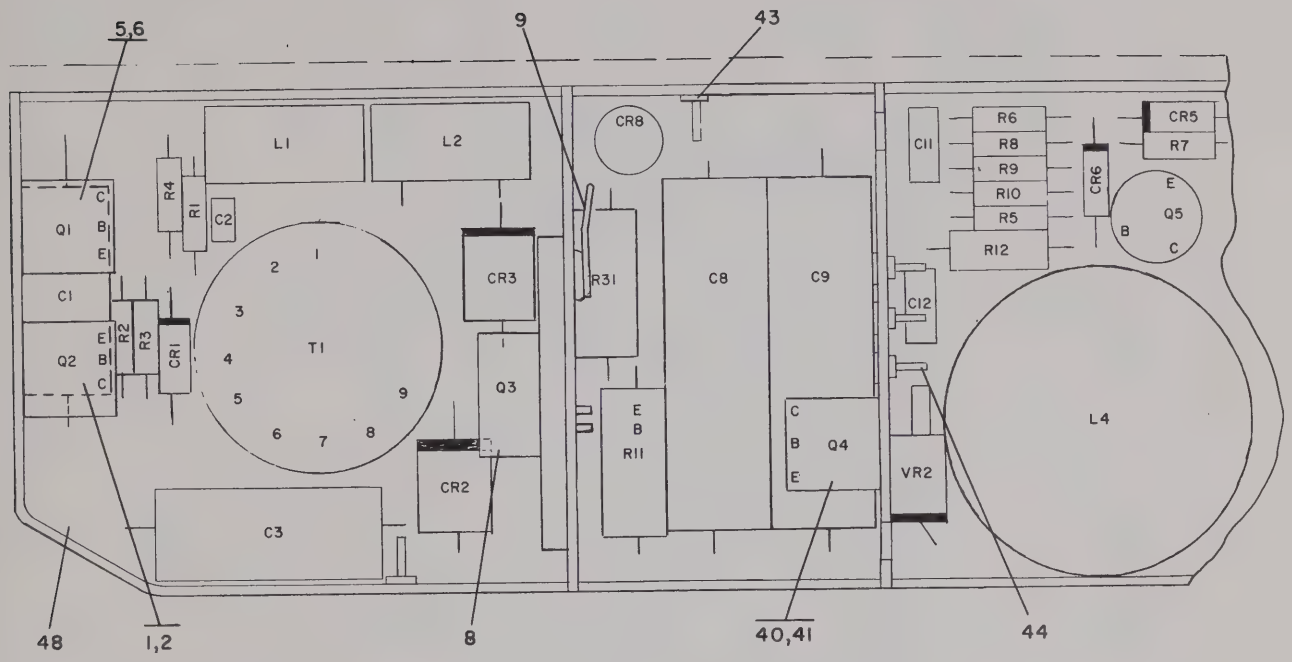
	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1105	126	RC07GF153K	3	RESISTOR, FXD, 15,000 OHMS 10%, 1/4 W 745-0791-000	Z2R39	1	
	127	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R40	1	
	128	RC07GF332K	3	RESISTOR, FXD, 3300 OHMS 10%, 1/4 W 745-0767-000	Z2R41	1	
	129	RC07GF182K	3	RESISTOR, FXD, 1800 OHMS 10%, 1/4 W 745-0758-000	Z2R38	1	
	130	RC07GF102K	3	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z2R37	1	
	131	2N2907A	3	TRANSISTOR 352-0551-010	Z2Q9	1	
	132	TR108	3	HEAT SINK 14953 352-9547-010		1	
	133	2N956	3	TRANSISTOR 352-0400-010	Z2Q10	1	
	134	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z2R87	1	
	135	2C067104X010 1A3	3	CAPACITOR, FXD, 0.1 UF 20%, 100 VDCW 56289 913-4240-040	Z2C13	1	
	136	192P47192	3	CAPACITOR, FXD, 0.00047 UF 10%, 200 VDCW 56289 933-1039-060	Z2C9	1	
	137	RN55D5112F	3	RESISTOR, FXD, 51,100 OHMS 1%, 1/8 W 705-1078-000	Z2R35	1	
R	*138	350-3006-010	3	MICROCIRCUIT, HYBRID	Z2A3	1	
	139	1N914	3	SEMICOND DEVICE 353-2906-000	Z2CR29	1	
	140	RC07GF123K	3	RESISTOR, FXD, 12,000 OHMS 10%, 1/4 W 745-0788-000	Z2R36	1	
	141	SG41	3	INTEGRATED CIRCUIT 93332 351-7077-020	Z2A11	1	
	142	767-1421-001	3	PEDESTAL		1	
R	*143	350-3005-010	3	MICROCIRCUIT, HYBRID	Z2A2	1	
	144	SF31	3	INTEGRATED CIRCUIT 93332 351-7105-020	Z2A7	1	
	145	767-1421-001	3	PEDESTAL		1	
R	*146	350-3006-010	3	MICROCIRCUIT, HYBRID	Z2A1	1	
	147	SG141	3	INTEGRATED CIRCUIT 93332 351-7093-020	Z2A12	1	
	148	767-1421-001	3	PEDESTAL		1	
R	*149	109D187X9025 T2	3	CAPACITOR, FXD, 180 UF 10%, 25 VDCW 56289 184-7804-000	Z2C11	1	
	150	RC07GF331K	3	RESISTOR, FXD, 330 OHMS 10%, 1/4 W 745-0731-000	Z2R9	1	
	151	RC07GF331K	3	RESISTOR, FXD, 330 OHMS 10%, 1/4 W 745-0731-000	Z2R12	1	
	152	RC07GF331K	3	RESISTOR, FXD, 330 OHMS 10%, 1/4 W 745-0731-000	Z2R17	1	
	153	2N956	3	TRANSISTOR 352-0400-010	Z2Q3	1	
	154	2N956	3	TRANSISTOR 352-0400-010	Z2Q4	1	
	155	2N956	3	TRANSISTOR 352-0400-010	Z2Q5	1	
	156	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR3	1	
	157	RN55D1002F	3	RESISTOR, FXD, 10,000 OHMS 1%, 1/8 W 705-1044-000	Z2R11	1	
	158	1N645	3	SEMICOND DEVICE 353-2607-000	Z2CR4	1	
	159	RN60D1001F	3	RESISTOR, FXD, 1000 OHMS 1%, 1/4 W 705-6596-000	Z2R10	1	
	160	RN60D1001F	3	RESISTOR, FXD, 1000 OHMS 1%, 1/4 W 705-6596-000	Z2R13	1	

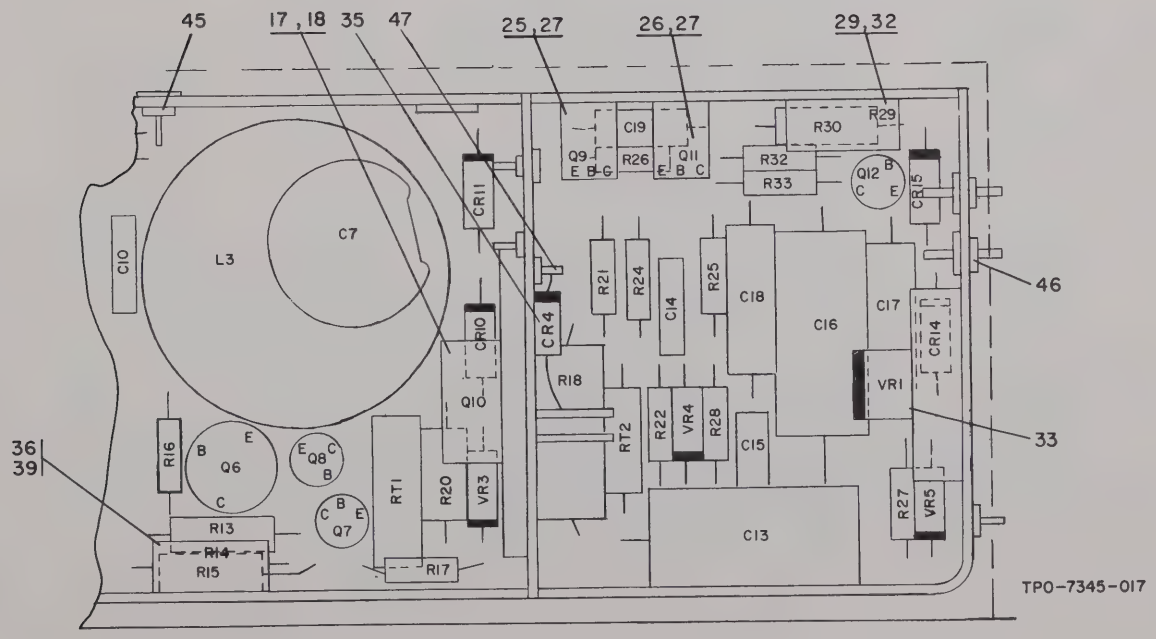
*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1105	161	RN55D1002F	3	RESISTOR, FXD, 10,000 OHMS 1%, 1/8 W 705-1044-000	Z2R16	1	
	162	RN55D1471F	3	RESISTOR, FXD, 1470 OHMS 1%, 1/8 W 705-1004-000	Z2R15	1	
	163	RN55D2611F	3	RESISTOR, FXD, 2610 OHMS 1%, 1/8 W 705-1016-000	Z2R14	1	
	164	RN60C4221F	3	RESISTOR, FXD, 4220 OHMS 1%, 1/8 W 705-6288-000	Z2R19	1	
	165	RN60D1001F	3	RESISTOR, FXD, 1000 OHMS 1%, 1/4 W 705-6596-000	Z2R18	1	
	166	192P4739R8	3	CAPACITOR, FXD, 0.047 UF 10%, 80 VDCW 56289 933-1039-210	Z2C1	1	
	167	192P4739R8	3	CAPACITOR, FXD, 0.047 UF 10%, 80 VDCW 56289 933-1039-210	Z2C2	1	
	168	RC20GF102K	3	RESISTOR, FXD, 1000 OHMS 10%, 1/2 W 745-1352-000	Z2R1	1	
	169	RN55D1782F	3	RESISTOR, FXD, 17,800 OHMS 1%, 1/8 W 705-1056-000	Z2R22	1	
	170	RN55D2151F	3	RESISTOR, FXD, 2150 OHMS 1%, 1/8 W 705-1012-000	Z2R23	1	
	171	777-0386-003	3	SPACER, SLV		6	
	172	85962	3	HOUSING 00779 372-2253-010		2	
	173	777-0436-001	3	SPACER, SLV		4	
	174	85964	3	CONTACT 00779 372-2252-010		16	
	175	85932-1	3	CONTACT 00779 372-2236-010		4	
	176	600-8133-007	2	FAB CARD		1	
1106	- 0	777-0355-001	1	CHASSIS, PWR SUP SEE FIG. 1101-26 FOR NHA		REF	
	1	2N4226	2	TRANSISTOR 352-0719-020	Q2	1	
	2	TXB2-032-037 B	2	HOLDER 98978 352-9984-020		1	
	- 3	330-2099-000	2	SCREW, MACH., NYLON, SLOT, FH, 4-40 X 3/16 COML AP		1	
	- 4	MW406-95	2	INSULATOR 08289 302-0640-360 AP		1	
	5	2N4226	2	TRANSISTOR 352-0719-020	Q1	1	
	6	TXB2P019-028 B	2	HOLDER 98978 352-9984-000		1	
	- 7	MW406-95	2	INSULATOR 08289 302-0640-360 AP		1	
	8	SJ1391	2	TRANSISTOR 352-0695-060	Q3	1	
	9	4007-6H0TTIN NED	2	TERMINAL 77147 304-0016-000		1	
	- 10	P313-0045-00 0	2	NUT, PLAIN, HEX., SST, 6-32 77250 313-0045-000 AP FOR 8 AND 9		2	
	- 11	310-0046-000	2	WASHER, FLAT, SST, 0.147 ID, 0.312 OD COML AP FOR 8 AND 9		2	
	- 12	MW375-140	2	INSULATOR 08289 302-0640-090 AP FOR 8 AND 9		2	
	- 13	TA2402A	2	INSULATOR WASHER 08289 352-9570-020 AP FOR 8 AND 9		1	
	- 14	TW140-210-03 5	2	SPACER 08289 352-9561-270 AP FOR 8 AND 9		2	
	- 15	310-0071-000	2	WASHER, LOCK, SST, 0.151 ID, 0.239 OD COML AP FOR 8 AND 9		2	

GROUP ASSEMBLY PARTS LIST



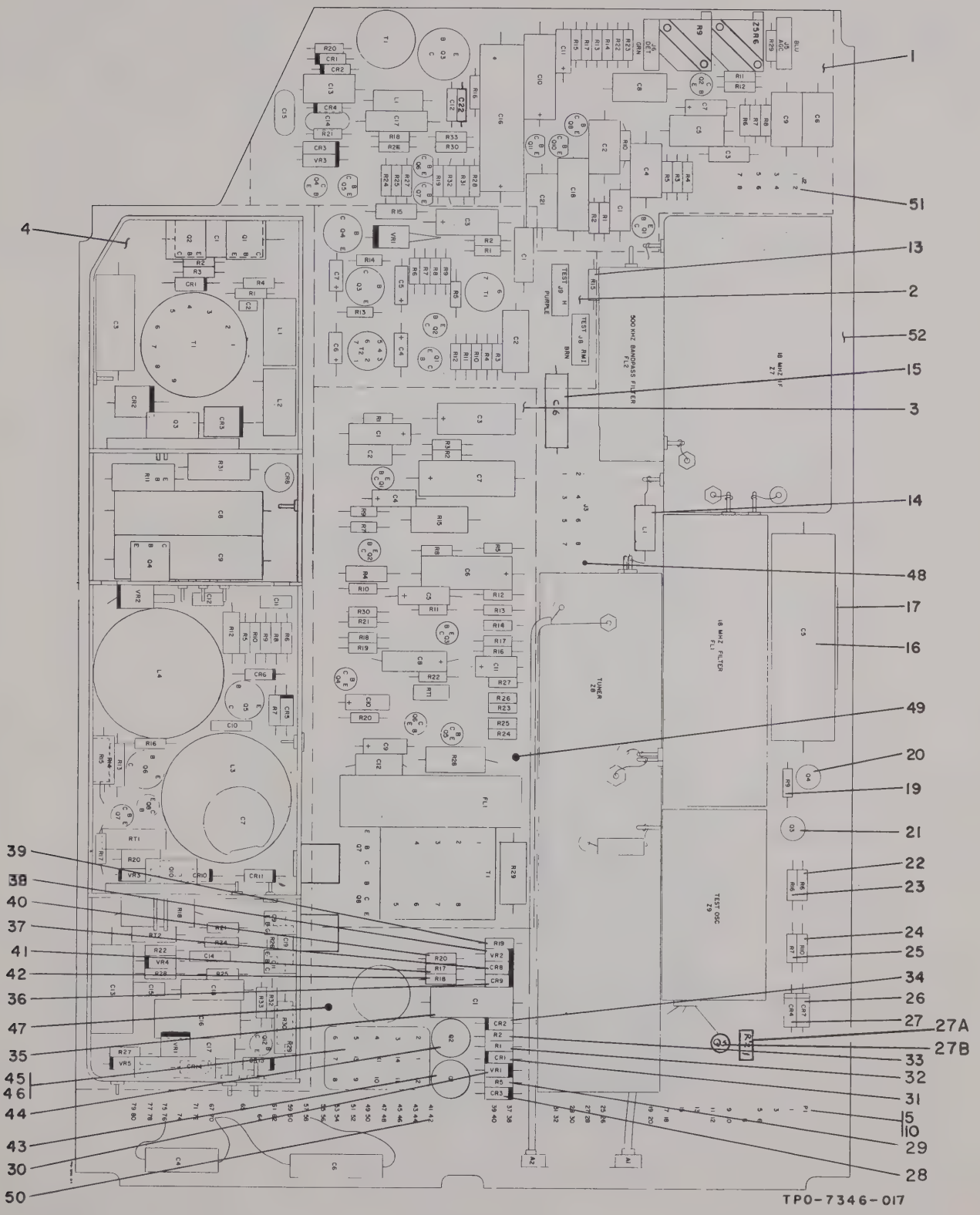


Power Supply Chassis
Figure 1106

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1106	- 16	MS51957-28	2	SCREW, MACH., SST, PAN HD, 6-32 X 3/8 343-0169-000 AP FOR 8 AND 9		2	
	17	2N3054	2	TRANSISTOR 352-0581-010	Q10	1	
	18	4007-6HOTTINNED	2	TERMINAL 77147 304-0016-000 AP		1	
	- 19	P313-0045-000	2	NUT, PLAIN, HEX., SST, 6-32 77250 313-0045-000 AP		2	
	- 20	310-0046-000	2	WASHER, FLAT, SST, 0.147 ID, 0.312 OD COML AP		2	
	- 21	MW375-140	2	INSULATOR 08289 302-0640-090 AP		2	
	- 22	TW140-210-035	2	SPACER 08289 352-9561-270 AP		2	
	- 23	310-0071-000	2	WASHER, LOCK, SST, 0.151 ID, 0.239 OD COML AP		2	
	- 24	MS51957-28	2	SCREW, MACH., SST, PAN HD, 6-32 X 3/8 343-0169-000 AP		2	
	25	MM2187	2	TRANSISTOR 04713 352-0551-030	Q9	1	
	26	2N956	2	TRANSISTOR 352-0400-010	Q11	1	
	27	TXB2P019-028B	2	HOLDER 98978 352-9984-000		2	
	- 28	MW265-90	2	INSULATOR 08289 302-0640-050 AP		2	
	29	H25	2	MOUNTING HARDWARE 80294 381-1446-000		1	
	- 30	P313-0484-010	2	NUT, PLAIN, HEX., BRS, 2-56 77250 313-0484-010 AP		2	
R	- 30A	761-5316-036	2	WASHER AP		2	
	- 31	P330-2287-000	2	SCREW, MACH., SST, FH, 2-56 X 3/8 77250 330-2287-000 AP		2	
R	- 31A	XB021767-3	2	INSULATOR 98291 352-9800-050 AP		1	
	32	3250LC10-201	2	RESISTOR, VAR, 200 OHMS 5%, 1 W 80294 381-1846-050	R29	1	
	33	1N3338B	2	SEMICOND DEVICE, ZENER DIO, 77.9 TO 86.1 V 04713 353-3670-010	VR1	1	
	- 34	P313-0005-000	2	NUT, PLAIN, HEX., SST, 1/4-28 77250 313-0005-000 AP		1	
	35	1N4002	2	SEMICOND DEVICE 353-6442-020	CR4	1	
	36	H25	2	MOUNTING HARDWARE 80294 381-1446-000		1	
	- 37	P313-0484-010	2	NUT, PLAIN, HEX., BRS, 2-56 77250 313-0484-010 AP		2	
	- 38	P330-2287-000	2	SCREW, MACH., SST, FH, 2-56 X 3/8 77250 330-2287-000 AP		2	
	39	3250LC10-201	2	RESISTOR, VAR, 200 OHMS 5%, 1 W 80294 381-1846-050	R14	1	
	40	S21825	2	TRANSISTOR 07263 352-0791-050	Q4	1	
	41	TXB2P019-028B	2	HOLDER 98978 352-9984-000		1	
	- 42	MW406-95	2	INSULATOR 08289 302-0640-360 AP		1	
	43	1P4-26A	2	TERMINAL 86577 306-0972-000		5	
	44	SL158-198	2	TERMINAL 12615 306-1270-000		7	
	45	SL157-197	2	TERMINAL 12615 306-1260-000		2	
	46	3PP4-66A	2	TERMINAL 86577 306-0953-000		1	
R	47	SL283-230	2	TERMINAL 12615 306-1265-000		1	
	48	777-0615-001	2	CHASSIS, PWR SUP		1	

GROUP ASSEMBLY PARTS LIST



Receiver Board
Figure 1107

GROUP ASSEMBLY PARTS LIST

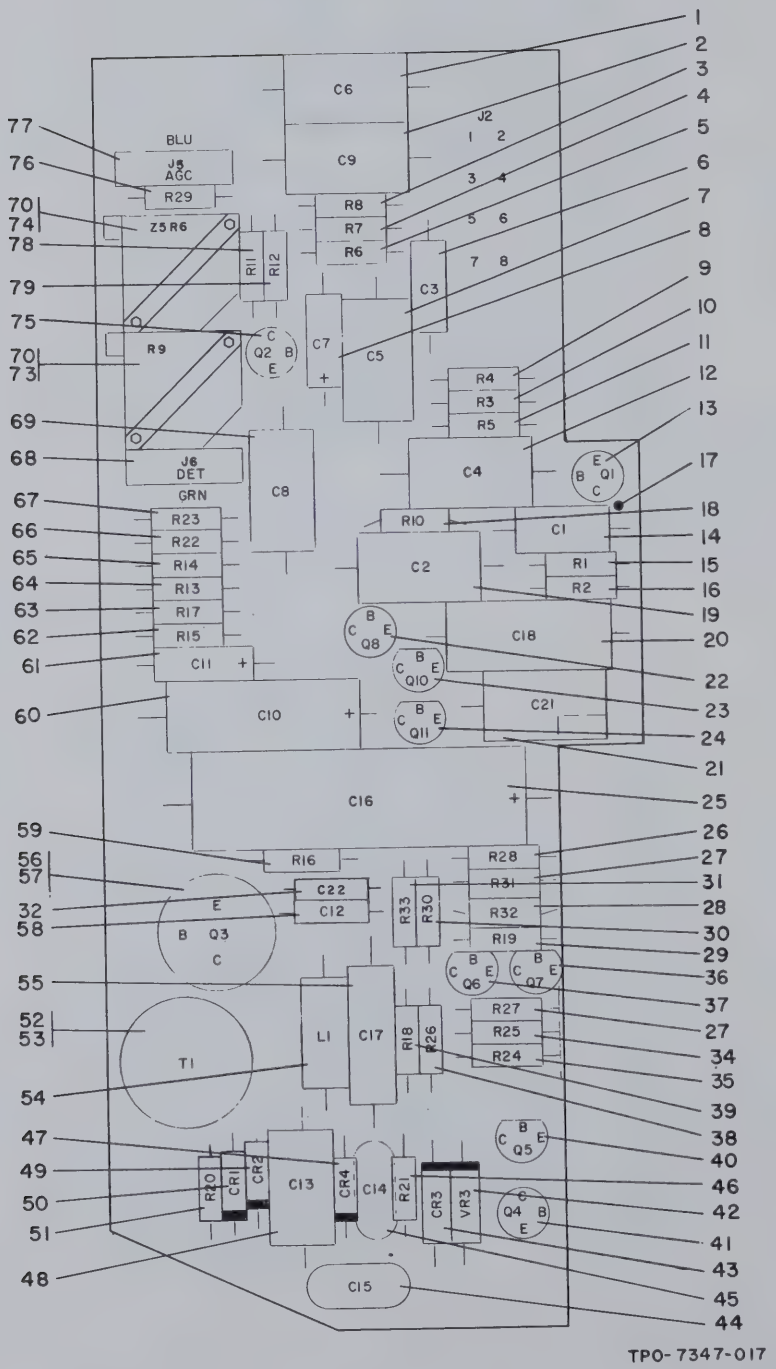
	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1107 -	0	777-7904-001	1	RECEIVER BOARD P SEE FIG. 1101-41 FOR NHA	Z1	REF	
*	1	777-7913-001	2	500 KHZ IF SEE FIG. 1108	Z3	1	
*	2	777-7916-001	2	CARD SERVO P SEE FIG. 1109	Z4	1	
*	3	777-7919-001	2	AUDIO SECTION OF RECEIVER BOARD P SEE FIG. 1110	Z5	1	
*	4	777-7922-001	2	POWER SUPPLY P SEE FIG. 1111	Z6	1	
	5	772-0626-001	2	CONNECTOR P	Z1P1	1	
-	6	P313-0045-00 0	2	NUT, PLAIN, HEX., SST, 6-32 77250 313-0045-000 AP		3	
-	7	MS35338-136	2	WASHER, LOCK, SST, 0.141 ID, 0.253 OD 310-0282-000 AP		3	
-	8	761-5316-019	2	WASHER AP		3	
R -	9	P330-1669-17 0	2	SCREW, MACH., SST, PAN HD, 6-30 X 5/8 77250 330-1669-170 AP		3	
	10	100-200-14-7	3	CLIP 99378 139-2231-000		2	
-	11	MS16535-54	3	RIVET, TUBULAR, STL, 0.089 DIA X 0.188 LG SHK 305-1733-000 AP		2	
*	12	777-7905-001	2	RECEIVER, INTERCONNECT P		1	
	13	RC07GF102K	3	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z1R15	1	
	14	MS90539-08	3	COIL, RF, 500 UH 240-2533-000	Z1L1	1	
	15	150D476X0020 R2	3	CAPACITOR, FXD, 47 UF 20%, 20 VDCW 56289 184-7664-000	Z1C6	1	
	16	D41822	3	CAPACITOR, FXD, 1250 UF 1000 TO 1600 UF, 5 VDCW 56289 183-1293-010	Z1C5	1	
	17	768-7288-001	3	CLIP, SPG TENS P		1	
-	18	MS16535-22	3	RIVET, TUBULAR, AL, 0.061 DIA X 0.125 LG SHK 305-1721-000 AP		4	
	19	RC07GF472K	3	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z1R9	1	
	20	2N956	3	TRANSISTOR 352-0400-010	Z1Q4	1	
	21	2N956	3	TRANSISTOR 352-0400-010	Z1Q3	1	
	22	RC07GF473K	3	RESISTOR, FXD, 47,000 OHMS 10%, 1/4 W 745-0809-000	Z1R6	1	
	23	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z1R16	1	
	24	RC07GF472K	3	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z1R10	1	
	25	RC07GF103K	3	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z1R7	1	
	26	1N645	3	SEMICOND DEVICE 353-2607-000	Z1CR7	1	
	27	1N645	3	SEMICOND DEVICE 353-2607-000	Z1CR4	1	
	27A	RC07GF223K	3	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000 EFF CI 68524	Z1R21	1	
	27B	2N956	3	TRANSISTOR 352-0400-010 EFF CI 68524	Z1Q5	1	
	28	1N645	3	SEMICOND DEVICE 353-2607-000	Z1CR3	1	
	29	RC07GF562K	3	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	Z1R5	1	
	30	1N758A	3	SEMICOND DEVICE, ZENER DIO, 10 V 5% 353-2724-000	Z1VR1	1	
	31	1N645	3	SEMICOND DEVICE 353-2607-000	Z1CR1	1	
	32	RN55D2152F	3	RESISTOR, FXD, 21,500 OHMS 1%, 1/8 W 705-1060-000	Z1R1	1	

*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1107	33	RC07GF222K	3	RESISTOR, FXD, 2200 OHMS 10%, 1/4 W 745-0761-000	Z1R2	1	
	34	1N645	3	SEMICOND DEVICE 353-2607-000	Z1CR2	1	
	35	150D157X0015 S2	3	CAPACITOR, FXD, 150 UF 20%, 15 VDCW 56289 184-7656-000	Z1C1	1	
	36	1N645	3	SEMICOND DEVICE 353-2607-000	Z1CR9	1	
	37	1N645	3	SEMICOND DEVICE 353-2607-000	Z1CR8	1	
	38	1N751A	3	SEMICOND DEVICE, ZENER DIO, 5.1 V 5%, 353-2710-000	Z1VR2	1	
	39	RC07GF332K	3	RESISTOR, FXD, 3300 OHMS 10%, 1/4 W 745-0767-000	Z1R19	1	
	40	RC07GF332K	3	RESISTOR, FXD, 3300 OHMS 10%, 1/4 W 745-0767-000	Z1R20	1	
	41	RC07GF332K	3	RESISTOR, FXD, 3300 OHMS 10%, 1/4 W 745-0767-000	Z1R17	1	
	42	RC07GF272K	3	RESISTOR, FXD, 2700 OHMS 10%, 1/4 W 745-0764-000	Z1R18	1	
	43	2N1711	3	TRANSISTOR 352-0400-000	Z1Q1	1	
	44	2N956	3	TRANSISTOR 352-0400-010	Z1Q2	1	
	45	3SAH1021	3	RELAY 01526 974-0785-000	Z1K1	1	
	46	RCRP800060-2 A	3	INSULATOR 19080 150-0684-090		1	
	47	777-0456-001	3	POST, CAPTIVE		3	
	48	777-0385-005	3	POST, CAPTIVE		4	
	49	777-0456-004	3	POST, CAPTIVE		6	
	50	768-3771-001	3	ADAPTER, CONTACT		63	
	51	85932-1	3	CONTACT 00779 372-2236-010		28	
	52	600-8133-006	2	FAB CARD		1	
1108 *	0	777-7913-001	1	500 KHZ IF SEE FIG. 1107-1 FOR NHA	Z3	REF	
	1	192P1049R8	2	CAPACITOR, FXD, 0.1 UF 10%, 80 VDCW 56289 933-1039-230	Z3C6	1	
	2	192P1049R8	2	CAPACITOR, FXD, 0.1 UF 10%, 80 VDCW 56289 933-1039-230	Z3C9	1	
	3	RC07GF101K	2	RESISTOR, FXD, 100 OHMS 10%, 1/4 W 745-0713-000	Z3R8	1	
	4	RC07GF182K	2	RESISTOR, FXD, 1800 OHMS 10%, 1/4 W 745-0758-000	Z3R7	1	
	5	RC07GF470K	2	RESISTOR, FXD, 47 OHMS 10%, 1/4 W 745-0701-000	Z3R6	1	
	6	150D225X0020 A2	2	CAPACITOR, FXD, 2.2 UF 20%, 20 VDCW 56289 184-7377-000	Z3C3	1	
	7	192P1049R8	2	CAPACITOR, FXD, 0.1 UF 10%, 80 VDCW 56289 933-1039-230	Z3C5	1	
	8	150D225X0020 A2	2	CAPACITOR, FXD, 2.2 UF 20%, 20 VDCW 56289 184-7377-000	Z3C7	1	
	9	RC07GF152J	2	RESISTOR, FXD, 1500 OHMS 5%, 1/4 W 745-0754-000	Z3R4	1	

*NONPROCURABLE ITEM



TPO-7347-017

500 kHz IF
Figure 1108

GROUP ASSEMBLY PARTS LIST

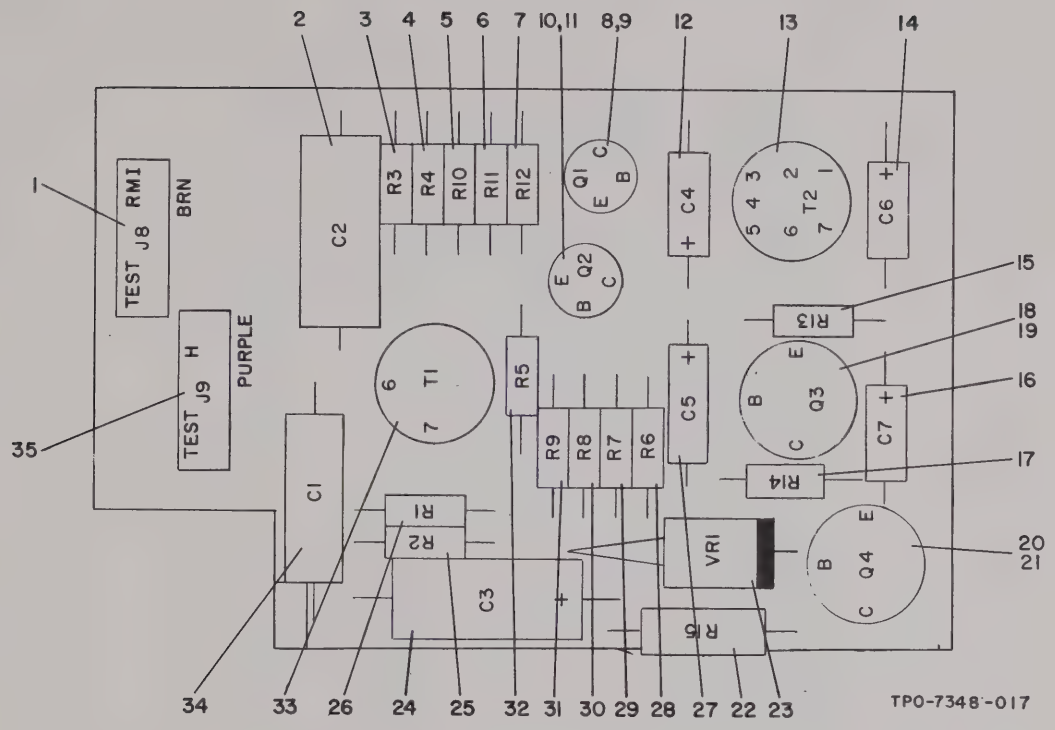
		FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1108		10	RC07GF100K	2	RESISTOR, FXD, 10 OHMS 5%, 1/4 W 745-0677-000	Z3R3	1	
		11	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z3R5	1	
		12	192P1049R8	2	CAPACITOR, FXD, 0.1 UF 10%, 80 VDCW 56289 933-1039-230	Z3C4	1	
		13	2N3337	2	TRANSISTOR 352-0697-010	Z3Q1	1	
		14	192P1039R8	2	CAPACITOR, FXD, 0.01 UF 10%, 80 VDCW 56289 933-1039-170	Z3C1	1	
		15	RC07GF122K	2	RESISTOR, FXD, 1200 OHMS 10%, 1/4 W 745-0752-000	Z3R1	1	
		16	RC07GF101K	2	RESISTOR, FXD, 100 OHMS 10%, 1/4 W 745-0713-000	Z3R2	1	
		17	85932-1	2	CONTACT 00779 372-2236-010		1	
		18	RC07GF122J	2	RESISTOR, FXD, 1200 OHMS 5%, 1/4 W 745-0751-000	Z3R10	1	
		19	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z3C2	1	
		20	150D336X0020 R2	2	CAPACITOR, FXD, 33 UF 20%, 20 VDCW 56289 184-7663-000	Z3C18	1	
		21	192P1049R8	2	CAPACITOR, FXD, 0.1 UF 10%, 80 VDCW 56289 933-1039-230	Z3C21	1	
		22	2N956	2	TRANSISTOR 352-0400-010	Z3Q8	1	
		23	2N956	2	TRANSISTOR 352-0400-010	Z3Q10	1	
		24	2N956	2	TRANSISTOR 352-0400-010	Z3Q11	1	
R	*	25	150D277X9015 S2	2	CAPACITOR, FXD, 270 PF 10%, 15 VDCW 56289 184-6329-410	Z3C16	1	
		26	RC07GF272K	2	RESISTOR, FXD, 2700 OHMS 10%, 1/4 W 745-0764-000	Z3R28	1	
		27	RN55D2153F	2	RESISTOR, FXD, 215,000 OHMS 1%, 1/8 W 705-1108-000	Z3R31	1	
		28	RN55D6812F	2	RESISTOR, FXD, 68,100 OHMS 1%, 1/8 W 705-1084-000	Z3R32	1	
		29	RC07GF150K	2	RESISTOR, FXD, 15 OHMS 10%, 1/4 W 745-0683-000	Z3R19	1	
		30	RC07GF150K	2	RESISTOR, FXD, 15 OHMS 10%, 1/4 W 745-0683-000	Z3R30	1	
		31	RN55D7500F	2	RESISTOR, FXD, 750 OHMS 1%, 1/8 W 705-0990-000	Z3R33	1	
		32	150D475X0010 A2	2	CAPACITOR, FXD, 4.7 UF 20%, 10 VDCW 56289 184-7379-000	Z3C22	1	
		33	RC07GF272K	2	RESISTOR, FXD, 2700 OHMS 10%, 1/4 W 745-0764-000	Z3R27	1	
		34	RC07GF151K	2	RESISTOR, FXD, 150 OHMS 10%, 1/4 W 745-0719-000	Z3R25	1	
		35	RC07GF563K	2	RESISTOR, FXD, 56,000 OHMS 10%, 1/4 W 745-0812-000	Z3R24	1	
		36	2N956	2	TRANSISTOR 352-0400-010	Z3Q7	1	
		37	2N956	2	TRANSISTOR 352-0400-010	Z3Q6	1	
		38	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z3R26	1	
		39	RC07GF123K	2	RESISTOR, FXD, 12,000 OHMS 10%, 1/4 W 745-0788-000	Z3R18	1	
		40	2N2907A	2	TRANSISTOR 352-0551-010	Z3Q5	1	
		41	2N930	2	TRANSISTOR 352-0517-010	Z3Q4	1	
		42	1N755A	2	SEMICOND DEVICE, ZENER DIO, 7.5 V 5% 353-2718-000	Z3VR3	1	

*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1108	43	1N3064	2	SEMICOND DEVICE 353-3404-000	Z3CR3	1	
	44	DM10F151J	2	CAPACITOR, FXD, 150 PF 5%, 500 VDCW 72136 912-3891-000	Z3C15	1	
	45	DM10F151J	2	CAPACITOR, FXD, 150 PF 5%, 500 VDCW 72136 912-3891-000	Z3C14	1	
	46	RC07GF223K	2	RESISTOR, FXD, 22,000 OHMS 10%, 1/4 W 745-0797-000	Z3R21	1	
	47	1N3064	2	SEMICOND DEVICE 353-3404-000	Z3CR4	1	
	48	192P1049R8	2	CAPACITOR, FXD, 0.1 UF 10%, 80 VDCW 56289 933-1039-230	Z3C13	1	
	49	1N3064	2	SEMICOND DEVICE 353-3404-000	Z3CR2	1	
	50	1N3064	2	SEMICOND DEVICE 353-3404-000	Z3CR1	1	
	51	RN55D4642F	2	RESISTOR, FXD, 46,400 OHMS 1%, 1/8 W 705-1076-000	Z3R20	1	
	52	A101	2	TRANSFORMER 81815 278-2091-010	Z3T1	1	
	53	768-8735-001	2	INSULATOR, DISK P		1	
	54	MS90539-08	2	COIL, RF, 500 UH 240-2533-000	Z3L1	1	
	55	150D106X0020 B2	2	CAPACITOR, FXD, 10 UF 20%, 20 VDCW 56289 184-7375-000	Z3C17	1	
	56	2N3011	2	TRANSISTOR 352-0579-030	Z3Q3	1	
	57	TR118	2	HEAT SINK 14953 352-9547-020	Z3HD1	1	
	58	CK16M104M	2	CAPACITOR, FXD, 100,000 PF 20%, 50 VDCW 86335 913-4496-010	Z3C12	1	
	59	RC07GF333K	2	RESISTOR, FXD, 33,000 OHMS 10%, 1/4 W 745-0803-000	Z3R16	1	
	60	150D476X0035 S2	2	CAPACITOR, FXD, 47 UF 20%, 35 VDCW 56289 184-7411-000	Z3C10	1	
	61	150D225X0020 A2	2	CAPACITOR, FXD, 2.2 UF 20%, 20 VDCW 56289 184-7377-000	Z3C11	1	
	62	RC07GF471K	2	RESISTOR, FXD, 470 OHMS 10%, 1/4 W 745-0737-000	Z3R15	1	
	63	RC07GF470K	2	RESISTOR, FXD, 47 OHMS 10%, 1/4 W 745-0701-000	Z3R17	1	
	64	RC07GF152K	2	RESISTOR, FXD, 1500 OHMS 10%, 1/4 W 745-0755-000	Z3R13	1	
	65	RC07GF152K	2	RESISTOR, FXD, 1500 OHMS 10%, 1/4 W 745-0755-000	Z3R14	1	
	66	RC07GF101K	2	RESISTOR, FXD, 100 OHMS 10%, 1/4 W 745-0713-000	Z3R22	1	
	67	RC07GF471K	2	RESISTOR, FXD, 470 OHMS 10%, 1/4 W 745-0737-000	Z3R23	1	
	68	105-0760-150	2	JACK 74970 360-0437-080	Z3J6	1	
	69	192P1049R8	2	CAPACITOR, FXD, 0.1 UF 10%, 80 VDCW 56289 933-1039-230	Z3C8	1	
	70	H25	2	MOUNTING HARDWARE 80294 381-1446-000		2	
	- 71	P313-0484-01 0	2	NUT, PLAIN, HEX., BRS, 2-56 77250 313-0484-010 AP		4	
	- 72	MS51957-5	2	SCREW, MACH., SST, PAN HD, 2-56 X 3/8 343-0126-000 AP		4	
	73	3250LC10-501	2	RESISTOR, VAR, 500 OHMS 5%, 1 W 80294 381-1846-060	Z3R9	1	
	74	3250LC10-103	2	RESISTOR, VAR, 10,000 OHMS 5%, 1 W 80294 381-1846-100	Z3Z5R6	1	
	75	2N3337	2	TRANSISTOR 352-0697-010	Z3Q2	1	
	76	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z3R29	1	
	77	105-0754-150	2	JACK 74970 360-0437-040	Z3J5	1	
	78	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z3R11	1	
	79	RC07GF470K	2	RESISTOR, FXD, 47 OHMS 10%, 1/4 W 745-0701-000	Z3R12	1	

GROUP ASSEMBLY PARTS LIST



Card Servo
Figure 1109

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1109 * 0	777-7916-001	1	CARD SERVO P SEE FIG. 1107-2 FOR NHA	Z4	REF	
1	105-0758-150	2	JACK 74970 360-0437-070	Z4J8	1	
2	192P4739R8	2	CAPACITOR, FXD, 0.047 UF 10%, 80 VDCW 56289 933-1039-210	Z4C2	1	
3	RC07GF271K	2	RESISTOR, FXD, 270 OHMS 10%, 1/4 W 745-0728-000	Z4R3	1	
4	RC07GF272K	2	RESISTOR, FXD, 2700 OHMS 10%, 1/4 W 745-0764-000	Z4R4	1	
5	RC07GF182K	2	RESISTOR, FXD, 1800 OHMS 10%, 1/4 W 745-0758-000	Z4R10	1	
6	RC07GF820K	2	RESISTOR, FXD, 82 OHMS 10%, 1/4 W 745-0710-000	Z4R11	1	
7	RC07GF820K	2	RESISTOR, FXD, 82 OHMS 10%, 1/4 W 745-0710-000	Z4R12	1	
8	2N956	2	TRANSISTOR 352-0400-010	Z4Q1	1	
9	7717-130DAP	2	CONVERTER 13103 352-9552-580		1	

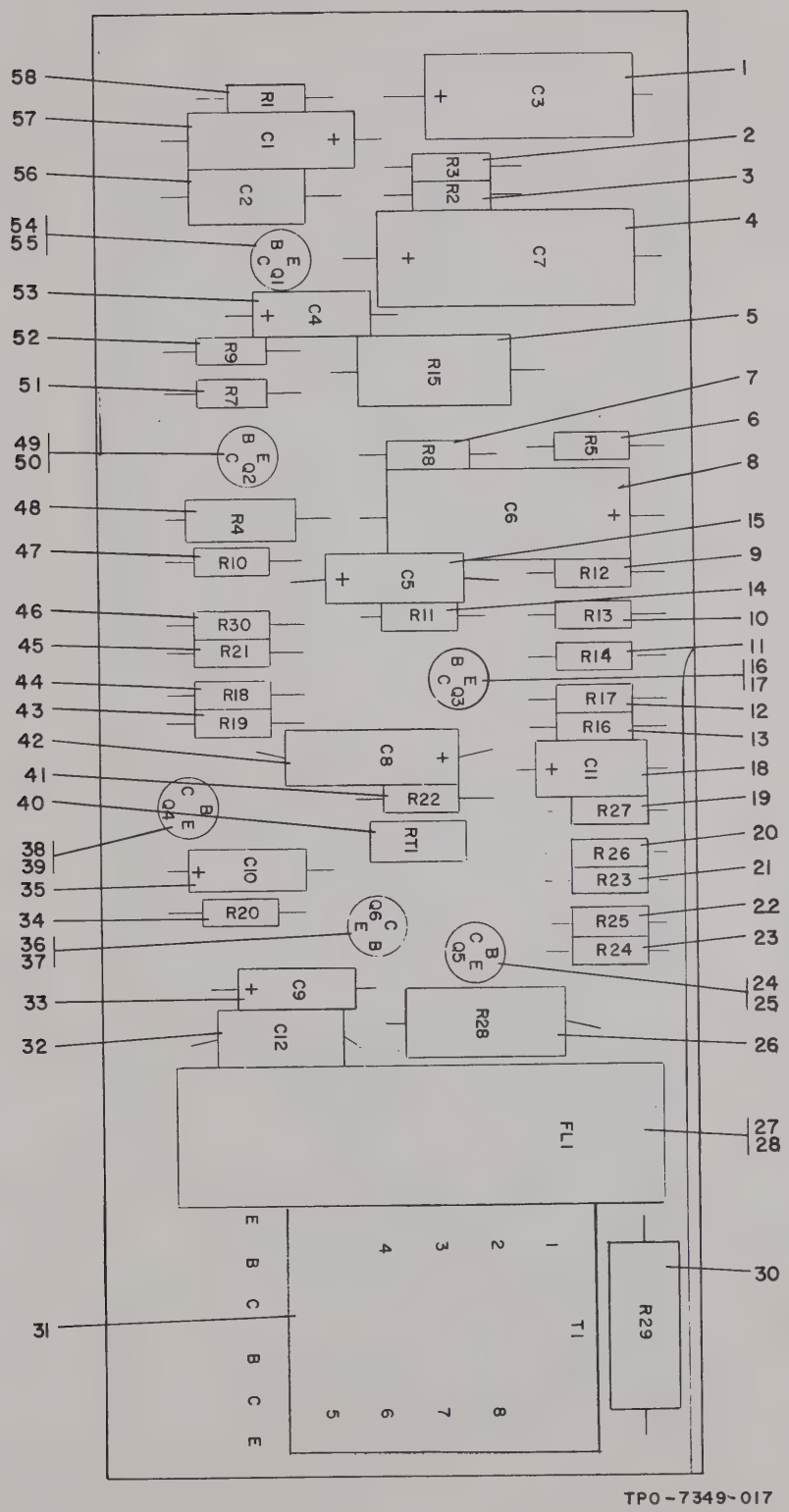
*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1109	10	2N956	2	TRANSISTOR 352-0400-010	Z4Q2	1	
	11	7717-130DAP	2	CONVERTER 13103 352-9552-580		1	
	12	150D473X0035 A2	2	CAPACITOR, FXD, 0.047 UF 20%, 35 VDCW 56289 184-7393-000	Z4C4	1	
	13	TF4SX13YY	2	TRANSFORMER 80223 677-0369-350	Z4T2	1	
	14	150D473X0035 A2	2	CAPACITOR, FXD, 0.047 UF 20%, 35 VDCW 56289 184-7393-000	Z4C6	1	
	15	RC07GF150K	2	RESISTOR, FXD, 15 OHMS 10%, 1/4 W 745-0683-000	Z4R13	1	
	16	150D473X0035 A2	2	CAPACITOR, FXD, 0.047 UF 20%, 35 VDCW 56289 184-7393-000	Z4C7	1	
	17	RC07GF150K	2	RESISTOR, FXD, 15 OHMS 10%, 1/4 W 745-0683-000	Z4R14	1	
	18	2N1711	2	TRANSISTOR 352-0400-000	Z4Q3	1	
	19	7717-64N	2	INSULATOR 13103 352-9552-550		1	
	20	2N1711	2	TRANSISTOR 352-0400-000	Z4Q4	1	
	21	7717-64N	2	INSULATOR 13103 352-9552-550		1	
	22	RC20GF331K	2	RESISTOR, FXD, 330 OHMS 10%, 1/2 W 745-1331-000	Z4R15	1	
	23	1N3030B	2	SEMICOND DEVICE, ZENER DIO, 27 V 5% 353-3135-000	Z4VR1	1	
	24	150D225X9035 B2	2	CAPACITOR, FXD, 2.2 UF 10%, 35 VDCW 56289 184-7704-000	Z4C3	1	
	25	RC07GF100K	2	RESISTOR, FXD, 10 OHMS 5%, 1/4 W 745-0677-000	Z4R2	1	
	26	RC07GF100K	2	RESISTOR, FXD, 10 OHMS 5%, 1/4 W 745-0677-000	Z4R1	1	
	27	150D473X0035 A2	2	CAPACITOR, FXD, 0.047 UF 20%, 35 VDCW 56289 184-7393-000	Z4C5	1	
	28	RC07GF472K	2	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z4R6	1	
	29	RC07GF332K	2	RESISTOR, FXD, 3300 OHMS 10%, 1/4 W 745-0767-000	Z4R7	1	
	30	RC07GF332K	2	RESISTOR, FXD, 3300 OHMS 10%, 1/4 W 745-0767-000	Z4R8	1	
	31	RC07GF472K	2	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z4R9	1	
	32	RC07GF391K	2	RESISTOR, FXD, 390 OHMS 10%, 1/4 W 745-0734-000	Z4R5	1	
	33	TF4SX13YY	2	TRANSFORMER 80223 677-0369-370	Z4T1	1	
	34	151D115X9020 W2	2	CAPACITOR, FXD, 1.1 UF 10%, 20 VDCW 56289 184-8363-000	Z4C1	1	
	35	105-0762-150	2	JACK 74970 360-0437-090	Z4J9	1	
1110 *	0	777-7919-001	1	AUDIO SECTION OF RECEIVER BOARD P SEE FIG. 1107-3 FOR NHA	Z5	REF	
	1	150D476X0035 S2	2	CAPACITOR, FXD, 47 UF 20%, 35 VDCW 56289 184-7411-000	Z5C3	1	
	2	RC07GF471K	2	RESISTOR, FXD, 470 OHMS 10%, 1/4 W 745-0737-000	Z5R3	1	

*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST



Audio Section of Receiver Board
Figure 1110

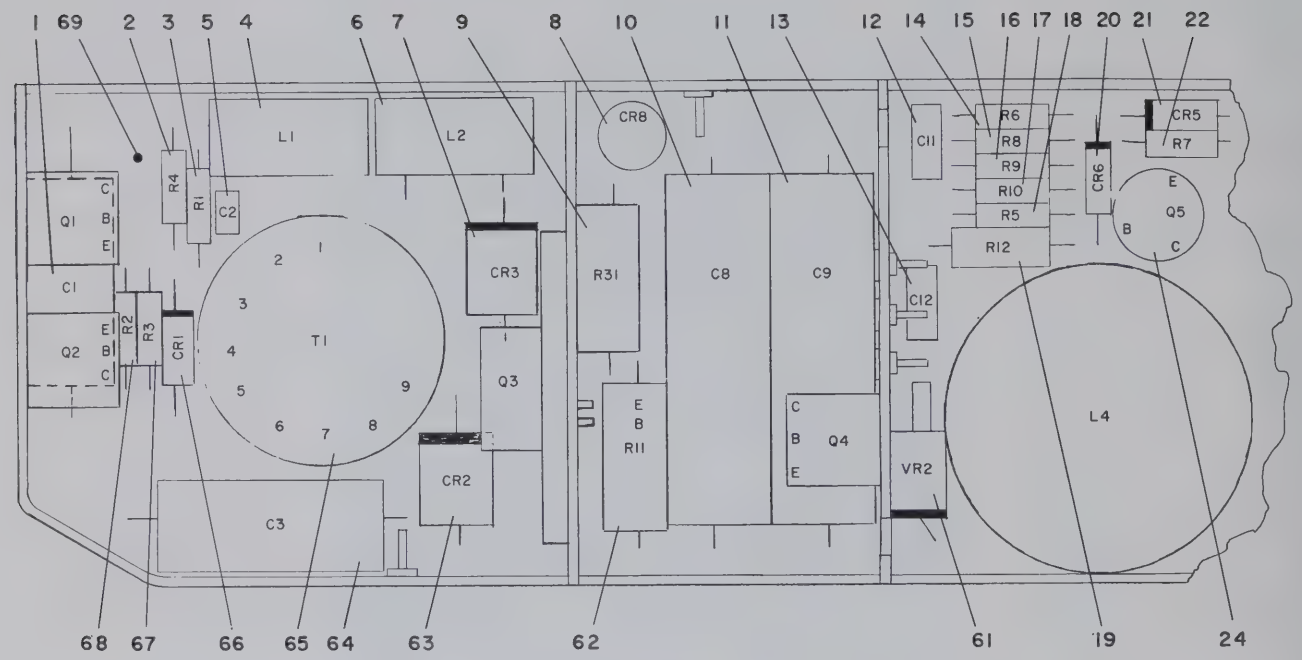
GROUP ASSEMBLY PARTS LIST

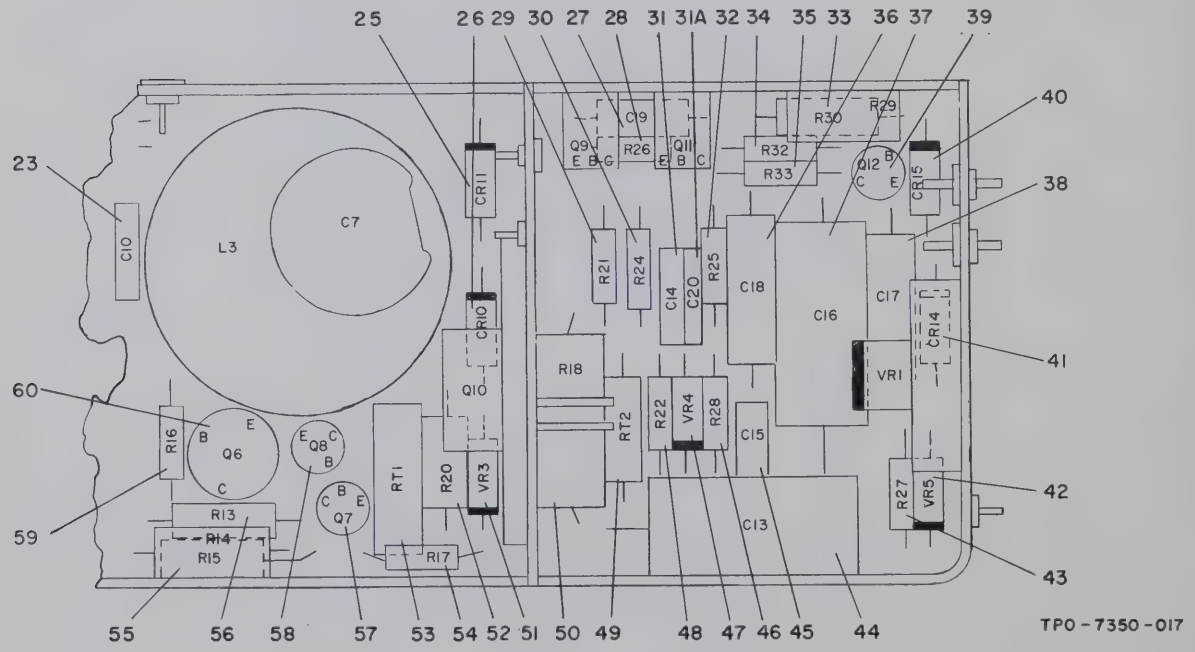
	FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1110		3	RC07GF273K	2	RESISTOR, FXD, 27,000 OHMS 10%, 1/4 W 745-0800-000	Z5R2	1	
		4	150D336X0035 S2	2	CAPACITOR, FXD, 33 UF 20%, 35 VDCW 56289 184-7696-000	Z5C7	1	
R	*	5	RW69V820	2	RESISTOR, FXD, 82 OHMS 5%, 3 W 747-5383-000	Z5R15	1	
		6	RC07GF472K	2	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z5R5	1	
		7	RC07GF101K	2	RESISTOR, FXD, 100 OHMS 10%, 1/4 W 745-0713-000	Z5R8	1	
		8	150D337X0006 S2	2	CAPACITOR, FXD, 330 UF 20%, 6 VDCW 56289 184-7647-000	Z5C6	1	
		9	RC07GF151K	2	RESISTOR, FXD, 150 OHMS 10%, 1/4 W 745-0719-000	Z5R12	1	
		10	RC07GF100K	2	RESISTOR, FXD, 10 OHMS 5%, 1/4 W 745-0677-000	Z5R13	1	
		11	RC07GF472K	2	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z5R14	1	
		12	RC07GF121K	2	RESISTOR, FXD, 120 OHMS 10%, 1/4 W 745-0716-000	Z5R17	1	
		13	RC20GF391K	2	RESISTOR, FXD, 390 OHMS 10%, 1/2 W 745-1335-000	Z5R16	1	
		14	RC07GF472K	2	RESISTOR, FXD, 4700 OHMS 10%, 1/4 W 745-0773-000	Z5R11	1	
		15	150D476X0006 B2	2	CAPACITOR, FXD, 47 UF 20%, 6 VDCW 56289 184-7401-000	Z5C5	1	
		16	2N956	2	TRANSISTOR 352-0400-010	Z5Q3	1	
		17	7717-130DAP	2	CONVERTER 13103 352-9552-580		1	
		18	150D105X0035 A2	2	CAPACITOR, FXD, 1 UF 20%, 35 VDCW 56289 184-7398-000	Z5C11	1	
		19	RC07GF391K	2	RESISTOR, FXD, 390 OHMS 10%, 1/4 W 745-0734-000	Z5R27	1	
		20	RC07GF391K	2	RESISTOR, FXD, 390 OHMS 10%, 1/4 W 745-0734-000	Z5R26	1	
		21	RC07GF562J	2	RESISTOR, FXD, 5600 OHMS 5%, 1/4 W 745-0775-000	Z5R23	1	
		22	RC07GF332K	2	RESISTOR, FXD, 3300 OHMS 10%, 1/4 W 745-0767-000	Z5R25	1	
		23	RC07GF332K	2	RESISTOR, FXD, 3300 OHMS 10%, 1/4 W 745-0767-000	Z5R24	1	
		24	2N3700	2	TRANSISTOR 352-0734-020	Z5Q5	1	
		25	7717-130DAP	2	CONVERTER 13103 352-9552-580		1	
		26	RW69V100	2	RESISTOR, FXD, 10 OHMS 5%, 3 W 747-5320-000	Z5R28	1	
		27	KL697	2	FILTER 80223 673-1143-030	Z5FL1	1	
		28	768-8823-001	2	INSULATOR, PLATE P		1	
	-	29	NAS1190C04P3	2	SCREW, SELF-LKG, SST, PAN HD, 4-40 X 3/16 80205 330-2637-000 AP		2	
		30	RW69V100	2	RESISTOR, FXD, 10 OHMS 5%, 3 W 747-5320-000	Z5R29	1	
		31	667-0171-010	2	TRANSFORMER 70674	Z5T1	1	
		32	192P1039R8	2	CAPACITOR, FXD, 0.01 UF 10%, 80 VDCW 56289 933-1039-170	Z5C12	1	
		33	150D105X0035 A2	2	CAPACITOR, FXD, 1 UF 20%, 35 VDCW 56289 184-7398-000	Z5C9	1	

*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1110	34	RC07GF471K	2	RESISTOR, FXD, 470 OHMS 10%, 1/4 W 745-0737-000	Z5R20	1	
	35	150D105X0035 A2	2	CAPACITOR, FXD, 1 UF 20%, 35 VDCW 56289 184-7398-000	Z5C10	1	
	36	2N3700	2	TRANSISTOR 352-0734-020	Z5Q6	1	
	37	7717-130DAP	2	CONVERTER 13103 352-9552-580		1	
	38	2N956	2	TRANSISTOR 352-0400-010	Z5Q4	1	
	39	7717-130DAP	2	CONVERTER 13103 352-9552-580		1	
	40	997F15	2	RESISTOR, THRM, 220 OHMS 10%, 1/2 W 10646 714-1721-000	Z5RT1	1	
	41	RC07GF471K	2	RESISTOR, FXD, 470 OHMS 10%, 1/4 W 745-0737-000	Z5R22	1	
	42	150D106X0020 B2	2	CAPACITOR, FXD, 10 UF 20%, 20 VDCW 56289 184-7375-000	Z5C8	1	
	43	RC07GF332K	2	RESISTOR, FXD, 3300 OHMS 10%, 1/4 W 745-0767-000	Z5R19	1	
	44	RC07GF681K	2	RESISTOR, FXD, 680 OHMS 10%, 1/4 W 745-0743-000	Z5R18	1	
	45	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z5R21	1	
	46	RC07GF681K	2	RESISTOR, FXD, 680 OHMS 10%, 1/4 W 745-0743-000	Z5R30	1	
	47	RC20GF821K	2	RESISTOR, FXD, 820 OHMS 10%, 1/2 W 745-1349-000	Z5R10	1	
	48	RC20GF220K	2	RESISTOR, FXD, 22 OHMS 10%, 1/2 W 745-1282-000	Z5R4	1	
	49	2N956	2	TRANSISTOR 352-0400-010	Z5Q2	1	
	50	7717-130DAP	2	CONVERTER 13103 352-9552-580		1	
	51	RC07GF103K	2	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z5R7	1	
	52	RC07GF103K	2	RESISTOR, FXD, 10,000 OHMS 10%, 1/4 W 745-0785-000	Z5R9	1	
	53	150D334X0035 A2	2	CAPACITOR, FXD, 0.33 UF 20%, 35 VDCW 56289 184-7406-000	Z5C4	1	
	54	2N956	2	TRANSISTOR 352-0400-010	Z5Q1	1	
	55	7717-130DAP	2	CONVERTER 13103 352-9552-580		1	
	56	192P1039R8	2	CAPACITOR, FXD, 0.01 UF 10%, 80 VDCW 56289 933-1039-170	Z5C2	1	
	57	150D106X0020 B2	2	CAPACITOR, FXD, 10 UF 20%, 20 VDCW 56289 184-7375-000	Z5C1	1	
	58	RC07GF823K	2	RESISTOR, FXD, 82,000 OHMS 10%, 1/4 W 745-0818-000	Z5R1	1	





Power Supply
Figure 1111

GROUP ASSEMBLY PARTS LIST

	FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1111 *	0	777-7922-001	1	POWER SUPPLY P SEE FIG. 1107-4 FOR NHA	Z6	REF	
	1	130D826X0030 T2	2	CAPACITOR, FXD, 82 UF 20%, 30 VDCW 56289 184-7874-000	Z6C1	1	
	2	RC07GF562K	2	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	Z6R4	1	
R	3	RC07GF470K	2	RESISTOR, FXD, 47 OHMS 10%, 1/4 W 745-0701-000 SB9	Z6R1	1	
	4	668-0164-010	2	REACTOR, 132 UH 95105	Z6L1	1	
R	5	CK15M472M	2	CAPACITOR, FXD, 4700 PF 20%, 50 VDCW 90634 913-4496-170 SB9	Z6C2	1	
	6	668-0166-010	2	REACTOR, 17 UH 95105	Z6L2	1	
	7	NS3001	2	SEMICOND DEVICE 13327 353-3667-010	Z6CR3	1	
	8	NS3001	2	SEMICOND DEVICE 13327 353-3667-010	Z6CR8	1	
	9	RW69V4R7	2	RESISTOR, FXD, 4.7 OHMS 5%, 3 W 747-5368-000	Z6R31	1	
	10	600D476G075D G4	2	CAPACITOR, FXD, 47 UF P75M10%, 75 VDCW 56289 183-1277-040	Z6C8	1	
	11	600D476G075D G4	2	CAPACITOR, FXD, 47 UF P75M10%, 75 VDCW 56289 183-1277-040	Z6C9	1	
	12	2C067104X010 1A3	2	CAPACITOR, FXD, 0.1 UF 20%, 100 VDCW 56289 913-4240-040	Z6C11	1	
	13	2C067104X010 1A3	2	CAPACITOR, FXD, 0.1 UF 20%, 100 VDCW 56289 913-4240-040	Z6C12	1	
	14	RC07GF560K	2	RESISTOR, FXD, 56 OHMS 10%, 1/4 W 745-0704-000	Z6R6	1	
	15	RC07GF563K	2	RESISTOR, FXD, 56,000 OHMS 10%, 1/4 W 745-0812-000	Z6R8	1	
	16	RC07GF471K	2	RESISTOR, FXD, 470 OHMS 10%, 1/4 W 745-0737-000	Z6R9	1	
	17	RC07GF821K	2	RESISTOR, FXD, 820 OHMS 10%, 1/4 W 745-0746-000	Z6R10	1	
	18	RC07GF562K	2	RESISTOR, FXD, 5600 OHMS 10%, 1/4 W 745-0776-000	Z6R5	1	
	19	RC20GF222K	2	RESISTOR, FXD, 2200 OHMS 10%, 1/2 W 745-1366-000	Z6R12	1	
	20	1N629	2	SEMICOND DEVICE 353-2584-000	Z6CR6	1	
	21	1N645	2	SEMICOND DEVICE 353-2607-000	Z6CR5	1	
	22	RC07GF122K	2	RESISTOR, FXD, 1200 OHMS 10%, 1/4 W 745-0752-000	Z6R7	1	
	23	3C2015BH3	2	CAPACITOR, FXD, 200 PF 5%, 200 VDCW 56289 913-5346-000	Z6C10	1	
	24	2N3440	2	TRANSISTOR 352-0603-010	Z6Q5	1	
	25	1N645	2	SEMICOND DEVICE 353-2607-000	Z6CR11	1	
	26	1N645	2	SEMICOND DEVICE 353-2607-000	Z6CR10	1	
	27	CT14-223K	2	CAPACITOR, FXD, 22,000 PF, 10%, 100 VDCW 90634 913-5661-160	Z6C19	1	
	28	RC07GF220K	2	RESISTOR, FXD, 22 OHMS, 10%, 1/4 W 745-0689-000	Z6R26	1	
	29	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z6R21	1	
	30	G2-220PORM1P CTV	2	RESISTOR, FXD, 220 OHMS 1%, 2 W 91637 746-3153-010	Z6R24	1	

*NONPROCURABLE ITEM

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM		PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1111	31	CS12BF685M	2	CAPACITOR, FXD, 6.8 UF, 20%, 35 VDCW 184-6087-000	Z6C14	1	
	31A	CK16M104M	2	CAPACITOR, FXD, 100,000 PF, 20%, 50 VDCW 90634 913-4496-010	Z6C20	1	
	32	RC07GF681K	2	RESISTOR, FXD, 680 OHMS 10%, 1/4 W 745-0743-000	Z6R25	1	
	33	RN60C5620F	2	RESISTOR, FXD, 562 OHMS 1%, 1/8 W 705-6267-000	Z6R30	1	
	34	RC07GF221K	2	RESISTOR, FXD, 220 OHMS 10%, 1/4 W 745-0725-000	Z6R32	1	
	35	RC07GF221K	2	RESISTOR, FXD, 220 OHMS 10%, 1/4 W 745-0725-000	Z6R33	1	
	36	CS13BD226M	2	CAPACITOR, FXD, 22 UF 20%, 15 VDCW 184-6160-000	Z6C18	1	
	37	130D826X0030 T2	2	CAPACITOR, FXD, 82 UF 20%, 30 VDCW 56289 184-7874-000	Z6C16	1	
	38	CS13BC336M	2	CAPACITOR, FXD, 33 UF 20%, 10 VDCW 184-6146-000	Z6C17	1	
	39	2N2907A	2	TRANSISTOR 352-0551-010	Z6Q12	1	
	40	1N645	2	SEMICOND DEVICE 353-2607-000	Z6CR15	1	
	41	1N645	2	SEMICOND DEVICE 353-2607-000	Z6CR14	1	
	42	1N753A	2	SEMICOND DEVICE, ZENER DIO, 6.2 V 5% 353-2714-000	Z6VR5	1	
	43	RC07GF102K	2	RESISTOR, FXD, 1000 OHMS 10%, 1/4 W 745-0749-000	Z6R27	1	
	44	109D187X0025 T2	2	CAPACITOR, FXD, 180 UF 20%, 25 VDCW 56289 184-7790-000	Z6C13	1	
	45	2C067104X010 1A3	2	CAPACITOR, FXD, 0.1 UF 20%, 100 VDCW 56289 913-4240-040	Z6C15	1	
	46	RN60C1001F	2	RESISTOR, FXD, 1000 OHMS 1%, 1/8 W 705-6273-000	Z6R28	1	
	47	1N751A	2	SEMICOND DEVICE, ZENER DIO, 5.1 V 5% 353-2710-000	Z6VR4	1	
	48	RC07GF222K	2	RESISTOR, FXD, 2200 OHMS 10%, 1/4 W 745-0761-000	Z6R22	1	
	49	TM1-8 1000-1 O	2	RESISTOR, THRM, 1000 OHMS 10%, 1/8 W 06668 714-2796-000	Z6RT2	1	
	50	RS200BR3300F	2	RESISTOR, FXD, 0.33 OHMS 1%, 3 W 91637 747-1990-070	Z6R18	1	
	51	1N753A	2	SEMICOND DEVICE, ZENER DIO, 6.2 V 5% 353-2714-000	Z6VR3	1	
	52	C1514	2	RESISTOR, FXD, 3.3 OHMS 1%, 1/4 W 15909 748-1514-000	Z6R20	1	
	53	763F2	2	RESISTOR, THRM, 10 OHMS 10%, 1 W 10646 714-1728-000	Z6RT1	1	
	54	RC07GF122K	2	RESISTOR, FXD, 1200 OHMS 10%, 1/4 W 745-0752-000	Z6R17	1	
	55	RN60C5620F	2	RESISTOR, FXD, 562 OHMS 1%, 1/8 W 705-6267-000	Z6R15	1	
	56	RN60C1101F	2	RESISTOR, FXD, 1100 OHMS 1%, 1/8 W 705-6274-000	Z6R13	1	
	57	2N4029	2	TRANSISTOR 352-0754-040	Z6Q7	1	
	58	2N2907A	2	TRANSISTOR 352-0551-010	Z6Q8	1	
	59	RC07GF152K	2	RESISTOR, FXD, 1500 OHMS 10%, 1/4 W 745-0755-000	Z6R16	1	
	60	2N3440	2	TRANSISTOR 352-0603-010	Z6Q6	1	
	61	1N3024B	2	SEMICOND DEVICE, ZENER DIO, 15 V 5% 353-3129-000	Z6VR2	1	

GROUP ASSEMBLY PARTS LIST

FIG. - ITEM	PART NO.	INDENT.	NOMENCLATURE		UNITS PER ASSY.	USAGE CODE
1111 62	RW69V821	2	RESISTOR, FXD, 820 OHMS 5%, 3 W 747-5358-000	Z6R11	1	
63	NS3001	2	SEMICOND DEVICE 13327 353-3667-010	Z6CR2	1	
64	150D227X0010 S2	2	CAPACITOR, FXD, 220 UF 20%, 10 VDCW 56289 184-7419-000	Z6C3	1	
65	A17030	2	TRANSFORMER 70674 664-1055-020	Z6T1	1	
66	1N645	2	SEMICOND DEVICE 353-2607-000	Z6CR1	1	
67	RC07GF180K	2	RESISTOR, FXD, 18 OHMS 10%, 1/4 W 745-0686-000	Z6R3	1	
68	RC07GF180K	2	RESISTOR, FXD, 18 OHMS 10%, 1/4 W 745-0686-000	Z6R2	1	
69	85962	2	CONNECTOR CONTACT HOUSING 00779 372-2253-010		30	

COLLINS